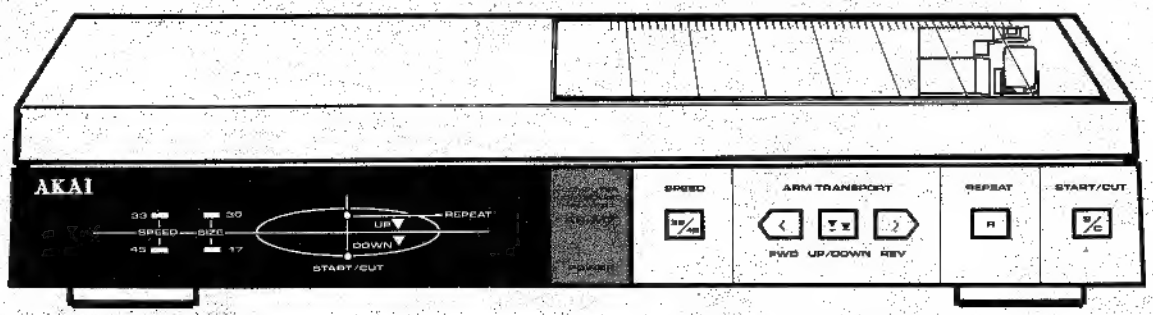
AP-M7/S

AKAI SERVICE MANUAL

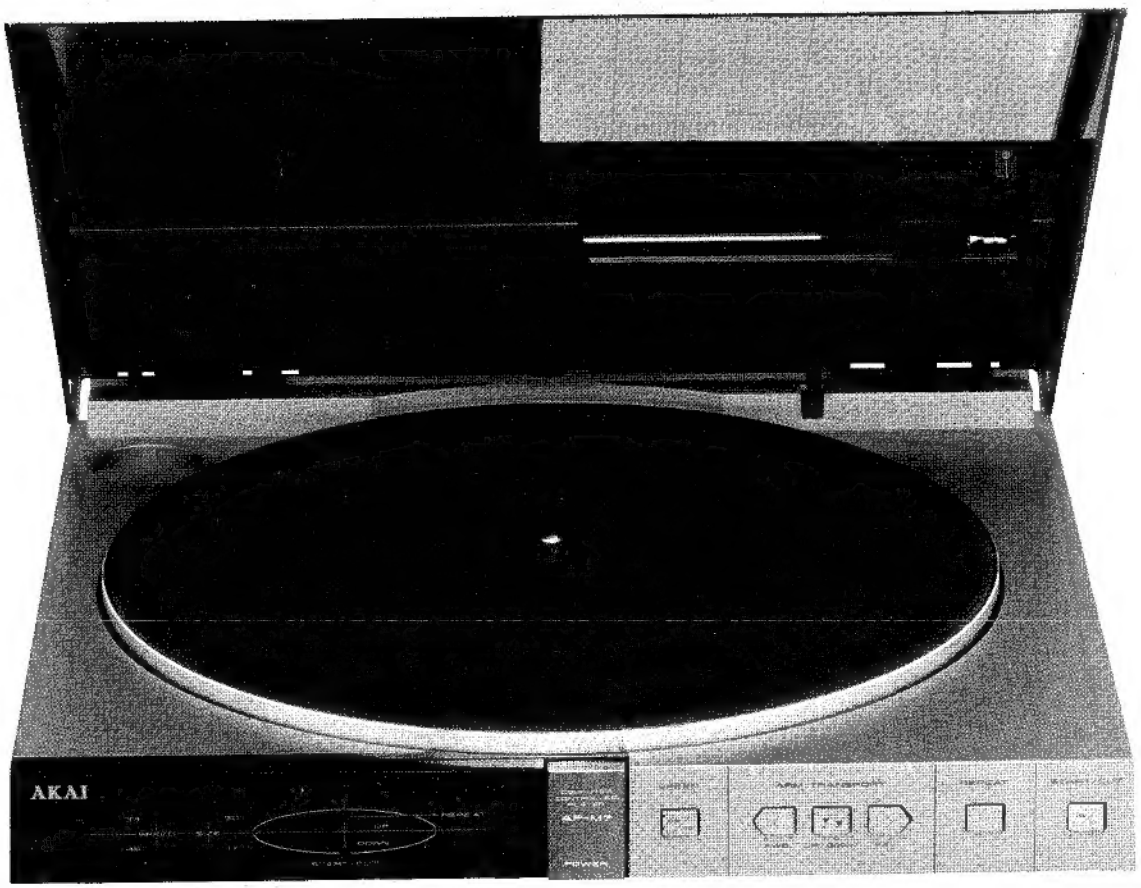


COMPUTER CONTROLLED PLAYER

MODEL AP-M7/S

ABBREVIATIONS FOR SERVICE MANUAL
MODEL AP-M7/S

ABBREVIATION	EXPLANATION
AC	ACcumulator
ALU	Arithmetic and Logic Unit
A.M.	Arm Motor
C	Carry
FWD	ForWarD
"H"	High (referring to voltage)
"L"	Low (referring to voltage)
LED	Light Emitting Diode
M.M.	Main Motor
PC	Program Counter
PLA	Programmable Logic Array
PTR	Photo TRansistor
RAM	Random Access Memory
REV	REVerse
ROM	Read Only Memory
S/C	Start/Cut
SENS	SENSor
VM	Variable Magnet



COMPUTER CONTROLLED PLAYER

MODEL AP-M7/S

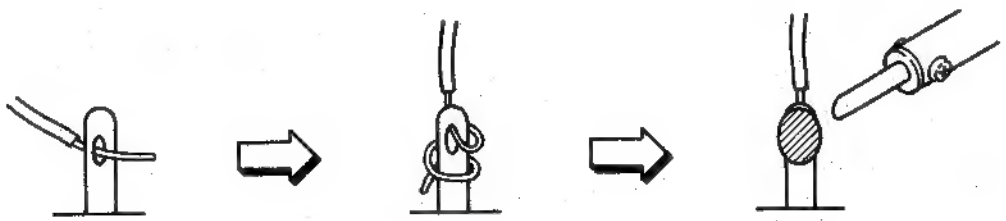
SAFETY INSTRUCTIONS

SAFETY CHECK AFTER SERVICING

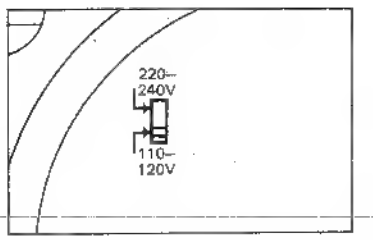
Confirm the specified insulation resistance between power cord plug prongs and externally exposed parts of the set is greater than 10 Mohms, but for equipment with external antenna terminals (tuner, receiver, etc.) and is intended for [C] or [A], specified insulation resistance should be more than 2.2 Mohms (ground terminals, microphone jacks, headphone jacks. line-in-out jacks etc.)

PRECAUTIONS DURING SERVICING

1. Parts identified by the ⚠ symbol parts are critical for safety.
   Replace only with parts number specified.
2. In addition to safety, other parts and assemblies are specified for conformance with such regulations as those applying to spurious radiation. These must also be replaced only with specified replacements.
   Examples: RF converters, tuner units, antenna selector switches, RF cables, noise blocking capacitors, noise blocking filters, etc.
3. Use specified internal wiring. Note especially:
   1) Wires covered with PVC tubing
   2) Double insulated wires
   3) High voltage leads
4. Use specified insulating materials for hazardous live parts. Note especially:
   1) Insulation Tape
   2) PVC tubing
   3) Spacers (Insulating Barriers)
   4) Insulation sheets for transistors
   5) Plastic screws for fixing microswitch (especially in turntable)
5. When replacing AC primary side components (transformers, power cords, noise blocking capacitors, etc.), wrap ends of wires securely about the terminals before soldering.



6. Observe that wires do not contact heat producing parts (heatsinks, oxide metal film resistors, fusible resistors, etc.).
7. Check that replaced wires do not contact sharp edged or pointed parts.
8. Also check areas surrounding repaired locations.
9. Use care that foreign objects (screws, solder droplets, etc.) do not remain inside the set.
10. Voltage Conversion
    Models for Japan, Canada, USA, Europe, UK and Australia are not equipped with this facility. Each machine is preset at the factory according to destination, but some machines can be set to 110V – 120V, or 220V – 240V as required. If voltage conversion on your machine is possible;
    1) Disconnect the power cord.
    2) Move the voltage selector located on the cabinet under the platter, with a screwdriver so that the marker is opposite the voltage for your area.



SECTION 1

SERVICE MANUAL

TABLE OF CONTENTS

For basic adjustments, measuring methods, and operating principles, refer to GENERAL TECHNICAL MANUAL.

I. SPECIFICATIONS

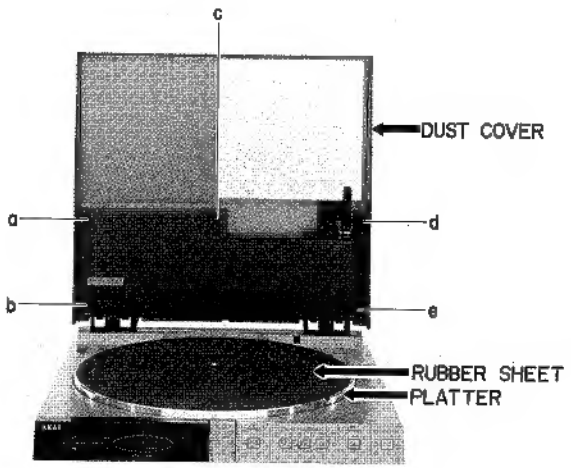
TURNTABLE (PLATTER)	Aluminum Alloy Diecast
DRIVE SYSTEM	FG Servo Direct Drive F/V Servo Linear Tracking Full Automatic
MOTOR	DC Servo Motor x 1, DC Motor for Arm Transport x 1
SPEED	33-1/3 & 45 rpm
WOW & FLUTTER	0.03% (W. RMS)
RUMBLE	75 dB (DIN-B)
TONEARM	Linear Tracking Dynamic Balanced Type
EFFECTIVE ARM LENGTH	90 mm
APPLICABLE CARTRIDGE WEIGHT	5.9 g (plug in type)
ARM LIFTER	Oil Damped
CARTRIDGE	VM Type (PC-7)
OUTPUT VOLTAGE	3.5 mV
CHANNEL SEPARATION	22 dB
OPTIMAL STYLUS PRESSURE	1.25 g (Stylus: RS-7)
POWER CONSUMPTION	12W (All models)
POWER REQUIREMENT	100V, 50/60 Hz for Japan 120V, 60 Hz for USA & Canada 220V, 50 Hz for Europe except UK 240V, 50 Hz for UK and Australia 110–120V/220–240V, 50/60 Hz switchable for other countries.
DIMENSIONS (LID CLOSED)	350(W) x 88 (H) x 320 (D) mm (13.8 x 3.5 x 12.6 inches)
WEIGHT	4.9 kg (10.8 lbs)

*** For improvement purposes, specifications and design are subject to change without notice.**

II. DISMANTLING OF UNIT

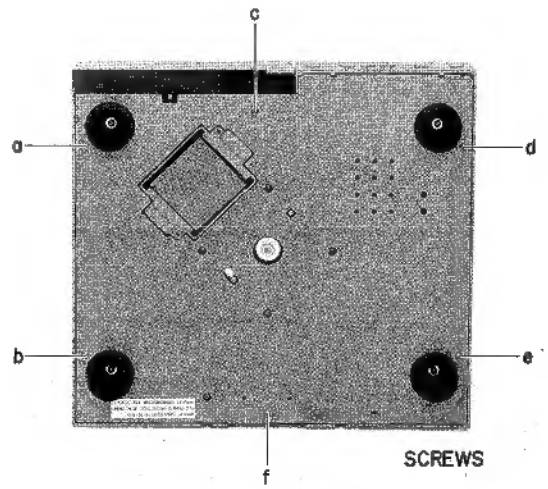
In case of trouble, etc. necessitating dismantling, please dismantle in the order shown in the photographs. Reassemble in reverse order.

1



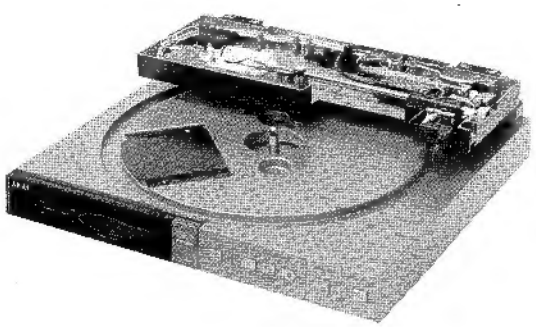
SCREWS

2



SCREWS

3



III. CONTROLS

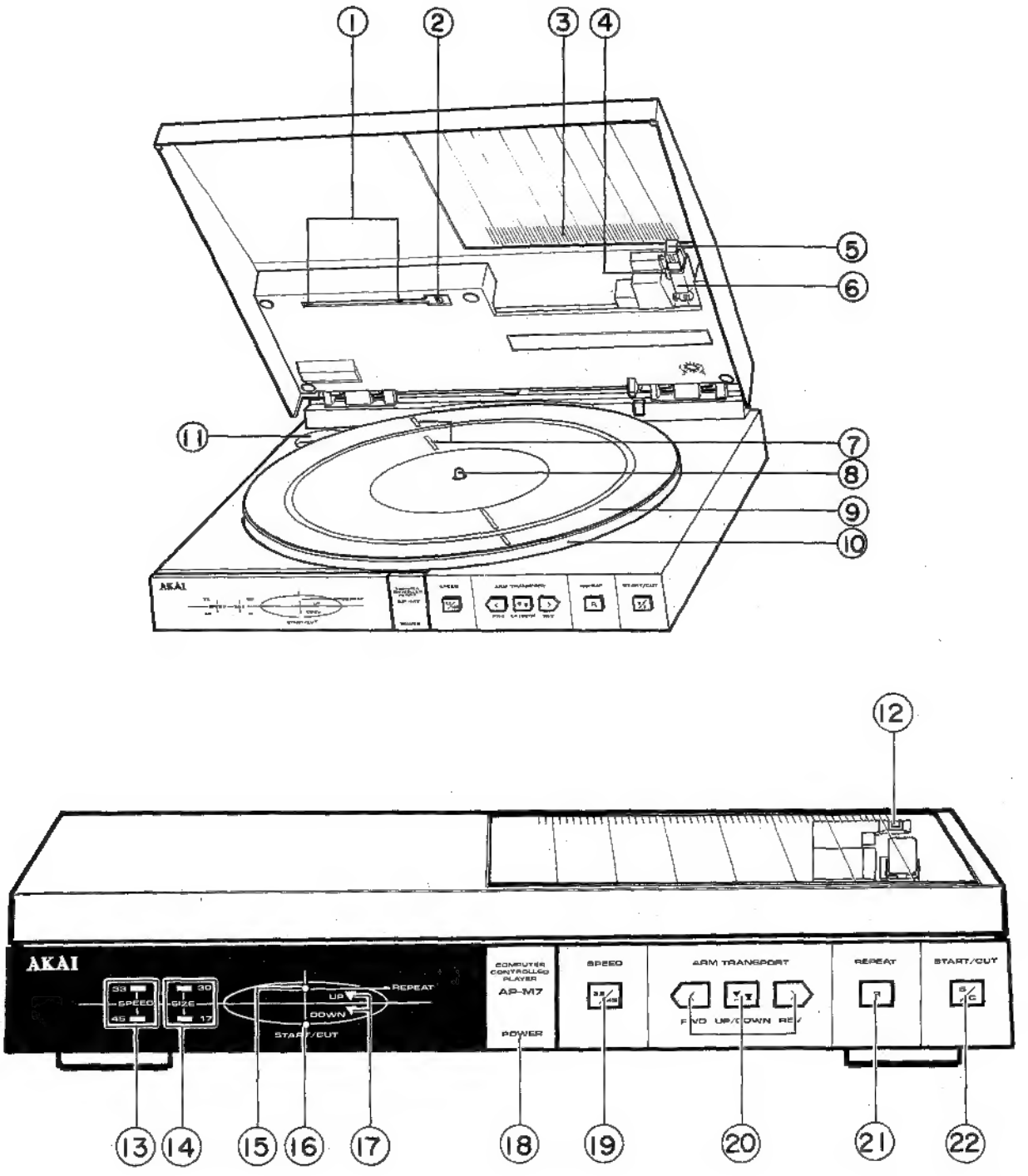


Fig. 3-1 Controls

1. RECORD SENSORS
2. AUTO/MANUAL SWITCH
3. RECORD SCALE
4. CARTRIDGE SCREW
5. CARTRIDGE (W/STYLUS)
6. TONE ARM
7. RECORD SENSING SLITS
8. SPINDLE
9. RUBBER SHEET
10. PLATTER
11. 45 RPM ADAPTOR HOLDER
12. TONE ARM POSITION MARKER
13. SPEED INDICATOR (33-1/3 rpm/45 rpm)
14. SIZE INDICATOR (30 cm/17 cm)
15. REPEAT INDICATOR
16. START/CUT INDICATOR
17. UP/DOWN INDICATOR
18. POWER SWITCH
19. SPEED SELECTOR (33/45)
20. ARM TRANSPORT BUTTONS
    FWD (<), UP/DOWN (▼ ▼), REV (>)
21. REPEAT BUTTON (R)
22. START/CUT BUTTON (S/C)

IV. PRINCIPAL PARTS LOCATION

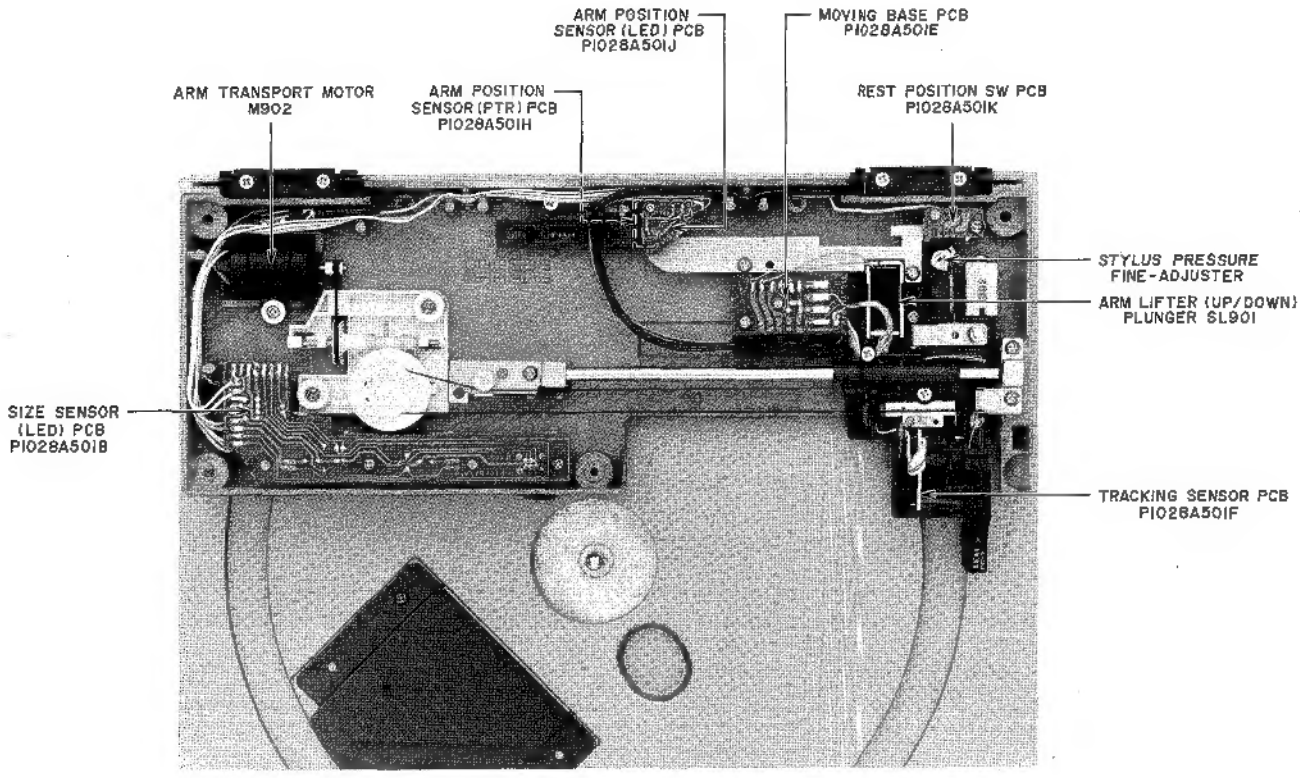


Fig. 4-1

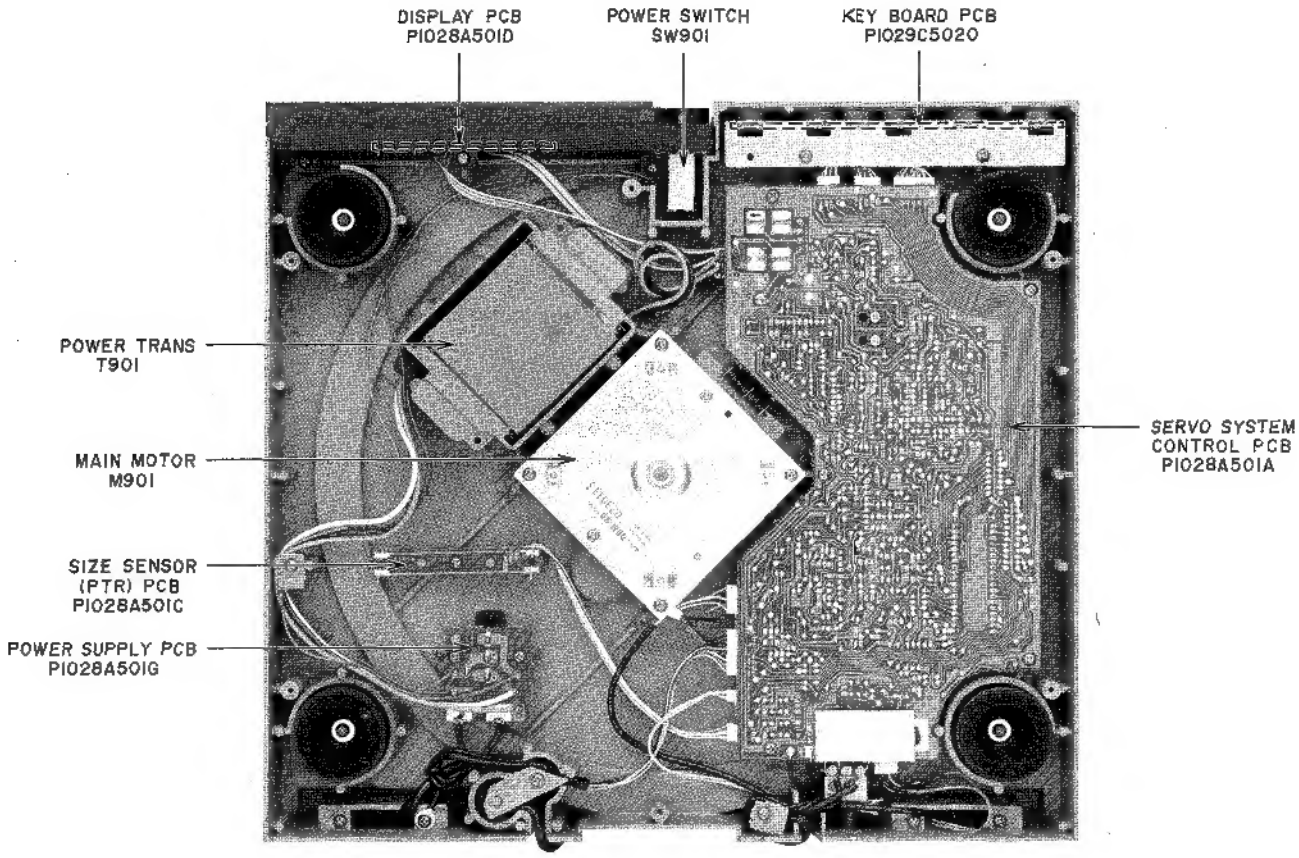


Fig. 4-2

V. CIRCUIT DESCRIPTION

5-1. THE PERIPHERAL CIRCUIT DIAGRAM OF MI-COM (IC5 LM6502A-111)

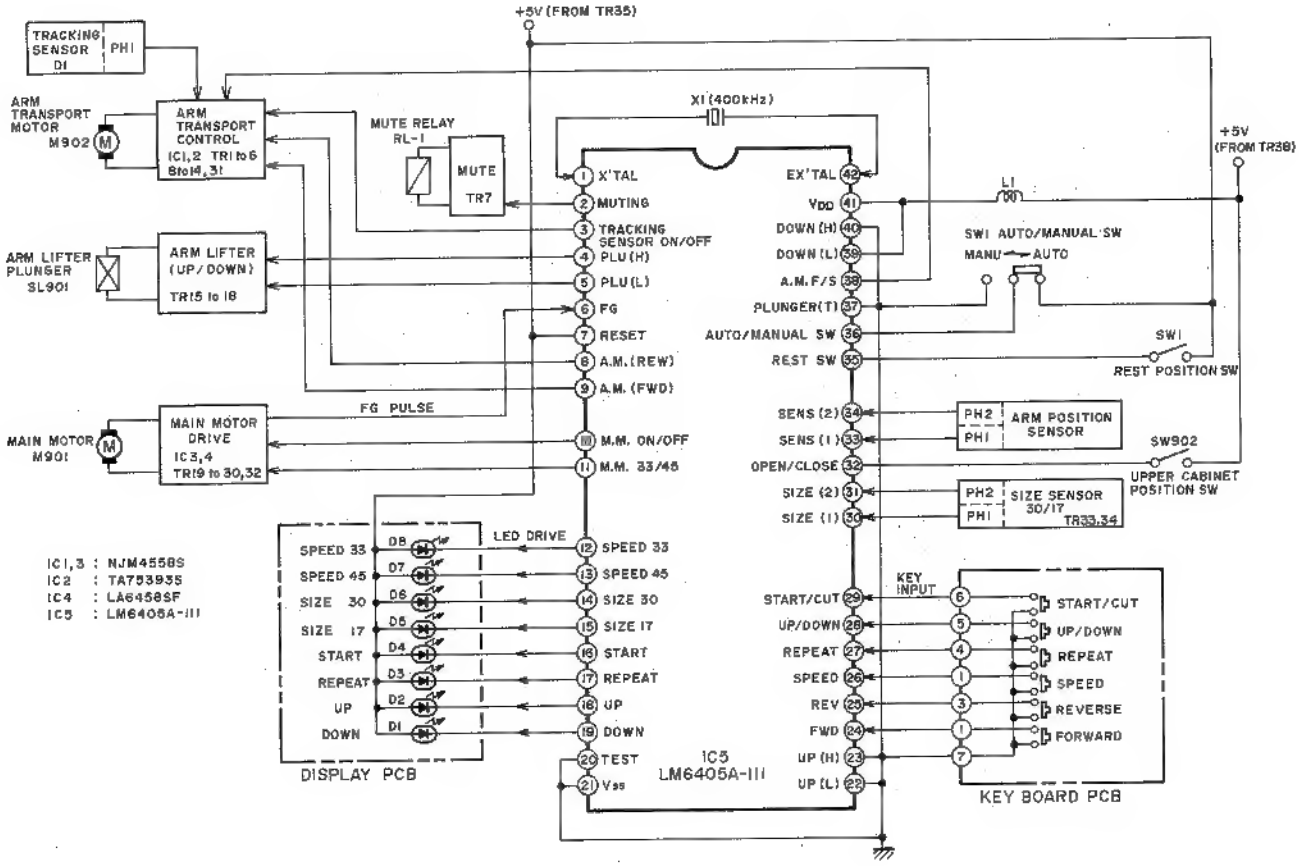


Fig. 5-1

5-2. DESCRIPTION OF MI-COM IC5 (LM6502A-111) TERMINALS

Pin No.	Symbol	Description
1	X'tal	Crystal OSC input (400 kHz)
2	C0	Muting at "H" ("L" while the stylus is on the record)
3	C1	Tracking Sensor ON/OFF signal output, Tracking Sensor is ON at "L" while playing the record and OFF at "H" in the other conditions.
4	C2	Plunger High Drive output, "H" when Tone Arm rises and while Tone Arm is up, "L" for 1.6 sec after Tone Arm starts to descend and "H" after that 1.6 sec.
5	C3	Plunger Drive output, "H" when Tone Arm rises and while Tone Arm is up. "L" when Tone Arm descends and while Tone Arm is down.
6	INT	Frequency Generator signal input. T ≒ 40 msec (33-1/3 rpm), 30 msec (45 rpm)
7	RES	Reset at "L" when power is turned on.
8	D0	Arm Motor Reverse output, "L" only While Tone Arm is moving away from the Spindle.
9	D1	Arm Motor Forward output, "L" only while Tone Arm is moving towards the Spindle.
10	D2	Main Motor ON/OFF output, "H" at Stop mode "L" at Play mode

Pin No.	Symbol	Description
11	D3	Main Motor Speed 33/45 output, "L" at 33-1/3 rpm "H" at 45 rpm
12	E0	Speed 33-1/3 rpm } LED Drive output. LED lights at "L"
13	E1	Speed 45 rpm
14	E2	Size 30 cm
15	E3	Size 17 cm
16	F0	Start
17	F1	Repeat
18	F2	Arm Up
19	F3	Arm Down
20	TEST	} Connected to ground
21	VSS	
22	G0	Arm Up Timer Preset (UPL) output } ○ Set the timing of the next action after the Tone Arm starts to rise. ○ Connected to ground to set the timing to 0.9 sec.
23	G1	Arm Up Timer Preset (UPH) output
24	G2	Forward Key signal input } "L" as each key is depressed.
25	G3	Reverse Key signal input
26	H0	Speed Key signal input.
27	H1	Repeat Key signal input
28	H2	Cue (UP/DOWN) Key signal input
29	H3	Start/Cut Key signal input
30	I0	Size Sensor 17 cm (SIZE 1) input } "L" when Size Sensor is ON, otherwise "H".
31	I1	Size Sensor 30 cm (SIZE 2) input
32	I2	Open/Close (Dust Cover SW) input, "L" when SW is open. (DUST COVER is open) "H" when SW is closed. (DUST COVER is closed)
33	A0	Arm Sensor 17 cm (SENS 1) "H" while the Tone Arm is located between the Lead-in and the Lead-out position for 17 cm record. Otherwise "L".
34	A1	Arm Sensor 30 cm (SENS 2) "H" while the Tone Arm located between the Lead-in and the Lead-out position for 30 cm record. Otherwise "L".
35	A2	Arm Rest SW "H" while Tone Arm is in Rest (Stand-by) position. "L" while Tone Arm is out of Rest position.
36	A3	Auto/Manual SW "H" at Auto mode, "L" at Manual mode
37	B0	Plunger High Drive Preset, Set the timing while Plunger is driven by the high voltage. Connected to ground to set the timing to 1.6 seconds.
38	B1	Arm Motor FAST/SLOW. "H" at Fast mode when FWD/REV button is depressed for more than 0.5 sec. "L" at SLOW mode when FWD/REV button is depressed for less than 0.5 sec.
39	B2	Tracking Sensor Preset (DOWN L) } Set the timing to turn on the Tracking Sensor. B2 is connected to +5V, B3 is connected to ground to set the timing to 1.9 sec.
40	B3	Tracking Sensor Preset (DOWN H)
41	VDD	Power Supply Terminal (+ 5V)
42	EX'tal	Crystal OSC input (400 kHz)

5-3. DESCRIPTION OF LED DISPLAY

LED Display	Description	Function
START/CUT	• "OFF" while Main Motor is OFF. (not turning) • "ON" while Main Motor is ON and also Servo Lock is ON. • Flickering when Main Motor is ON and turning but out of Servo Lock.	• LED starts flickering and changes to steady lighting after S/C button is depressed. • LED lights in the same way as above when the speed is changed (33 → 45 or 45 → 33) while the Main Motor is Turning.
UP	• "ON" while Tone Arm is up.	• LED indicates POWER-ON as well, since Tone Arm is always up when the power is turned on.
DOWN	• "ON" while Tone Arm is down.	• LED is lit while the stylus is on the record.
REPEAT	• "ON" while REPEAT is engaged.	• LED is not lit in MANUAL mode. • REPEAT will be concelled if the Dust Cover is opened or the S/C button is depressed during repeat operation.
SPEED 33	• "ON" while 33-1/2 rpm is selected.	• LED indicates POWER-ON as well, since 33-1/3 is pre-set when the power is turned on.
SPEED 45	• "ON" while 45 rpm is selected.	• LED will be extinguished if the Dust Cover is opened, and the 33-1/3 LED will be lit instead.
SIZE 30	• "ON" while a 30 cm record is on the platter.	• LED lights up after the record size is detected and remains on until the Dust Cover is opened. (See Note 1)
SIZE 17	• "ON" while a 17 cm record is on the platter.	• The same function as SIZE 30. (See Note 1)
SIZE 30/17 in MANUAL mode	• "Flickering" when START Button is depressed, also if the Tone Arm is up, and away from the Arm Rest.	• Flickering Indicates that Auto Lead-in & Size Sensors are not executed in Manual mode.

NOTE. 1. Refer to the description of SIZE LED DISPLAY in this section.

5-4. DESCRIPTION OF SIZE LED DISPLAY

Size Display	Description (condition/meaning)
30 SIZE 17 Both LEDs flicker simultaneously.	• No record is on the platter, or no record size is detected in AUTO mode. (1. For about 2 seconds, after S/C button is depressed. 2. While the Tone Arm is located out of the Arm Rest)
Both LEDs flicker alternately.	• Tone Arm is up and located between LEAD-IN (30 cm) and LEAD-OUT (17 cm) in MANUAL mode. • For about 2 seconds, after START/CUT button is depressed in MANUAL mode. • Flickers 4 timer when the power is turned on or when the Dust Cover is opened.
Either one of LEDs is lit.	• The record size is detected in AUTO mode. (Holds the condition which is detected by depressing S/C or FWD button until the Dust Cover is opened.)
None of LEDs are lit.	• While playing a record (stylus is on the record) in MANUAL mode. • Record size is not detected or not yet detected in AUTO mode. • Initial modes such as when the power is turned on or while or after the Dust Cover is opened in AUTO/MANUAL modes.

5-5. QUICK REPEAT OPERATION (Refer to Figs. 5-2 & 5-3)

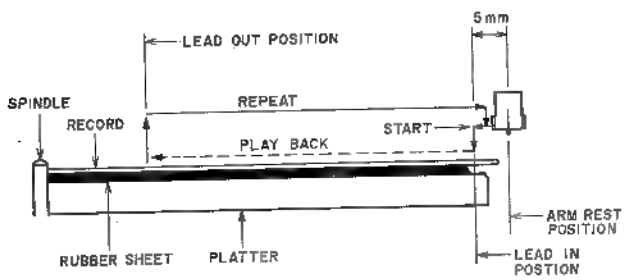


Fig. 5-2 30 cm Record

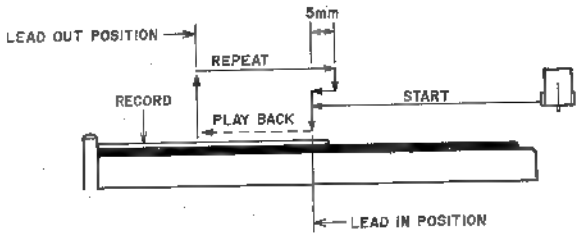


Fig. 5-3 17 cm Record

The Tone Arm movements when REPEAT is in action are shown in Figs. 5-2 & 5-3.
As shown, the Tone Arm will not return to the Stand-by position (Arm Rest position) nor go directly to the beginning of the record (Lead-in position), but will go back to the point 5 mm further away from the Lead-in position then move forward to the Lead-in position.
This Lead-in position for 30 cm records is the same as the Arm Rest position.
If REPEAT is selected during the regular CUT operation, REPEAT operation will be executed even if REPEAT was not engaged previously.

5-6. F/V SERVO LINEAR TRACKING SYSTEM

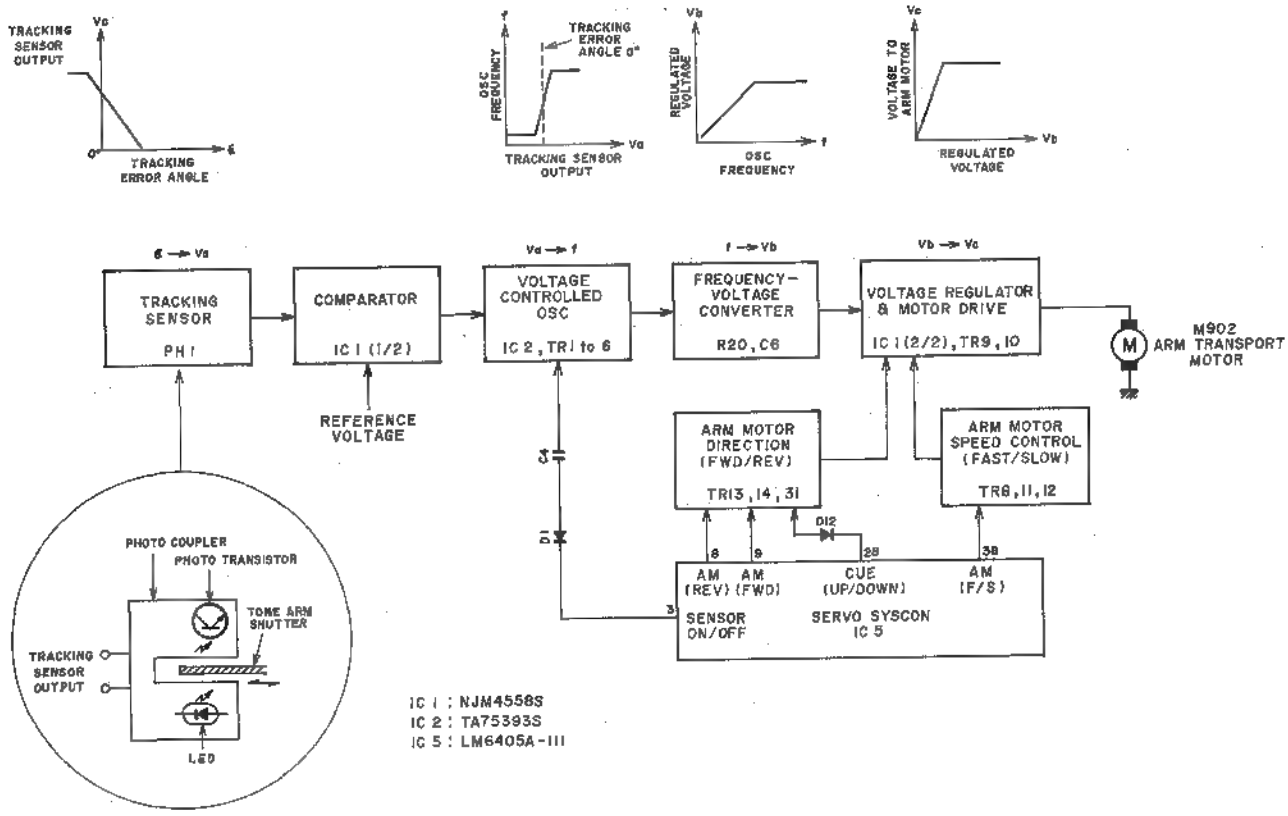


Fig. 5-4 F/V Servo Linear Tracking System Block Diagram

1) While tracking, a small tracking error will be produced by the movement of the Shutter on the Tone Arm and it is detected by the Tracking Sensor (PH-1), then its output voltage is compared with the Reference Voltage and amplified by the Comparator IC1 (1/2) to produce the output of ⊕ or ⊖.
   This output enters the Voltage Controlled Oscillator and is converted to various frequency deviations according to its level at various instants, then it passes the Frequency-Voltage converter (R20, C6) and is supplied to the Voltage Regulator & Motor Drive circuit to drive the Arm Transport Motor (M902).
2) When the FWD button is depressed, the level "L" is supplied from IC5 pin ⑨ to TR31 → TR31 is turned ON → the level at IC1 (2/2) pin ⑦ increases, so the output of IC1 (2/2) pin ⑧ becomes negative (about −11V) → TR10 is turned ON.
   Thus −12V is supplied to the Arm Transport Motor to move the Tone Arm in the forward direction.
3) When the REV button is depressed, the level "L" is supplied from IC5 pin ⑧ to TR14 → TR14 is turned ON → TR13 is turned ON → the level at IC1 (2/2) pin ⑦ decrease, so the output of IC1 (1/2) pin ⑧ becomes positive (about +11V) → TR9 is turned ON. Thus +12V is supplied to the Arm Transport Motor to move the Tone Arm in the reverse direction.
4) The speed of the Arm Transport Motor (M902) is controlled by the signals from IC5 pin ㊳.
   The level at IC pin ㊳ is "H" when either the FWD or REV button is depressed for more than 0.5 seconds, otherwise "L".
   Consequently while the level is "H" (means in FAST mode), TR12 & 11 are turned OFF → TR8 is turned OFF, so the level at IC1 (2/2) pin ⑧ increases (about ±10~11V). Thus more voltage is supplied to the Arm Transport Motor than normal, and Fast speed (about 10 mm/sec) is obtained.
   When either the FWD or REV button is depressed for less than 0.5 seconds, TR12 & 11 are ON, TR8 is ON, and the level at IC1 (2/2) pin ⑧ is about 4.5V. Thus about ±5V is supplied to the Arm Transport Motor and the Tone Arm moves forwards or backwards at normal speed.

5-7. ARM LIFTER CIRCUIT (Refer to Figs. 5-5 to 5-7)

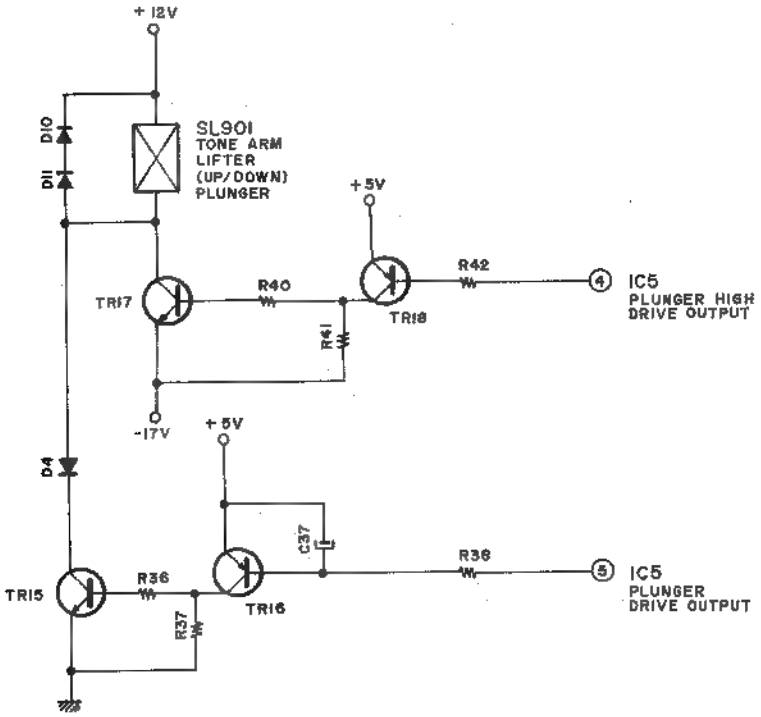


Fig. 5-5 Arm Lifter Drive Circuit

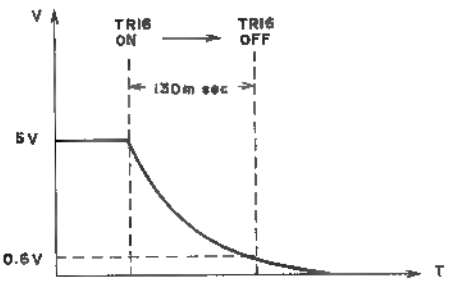


Fig. 5-6 Voltage at the Collector of TR16

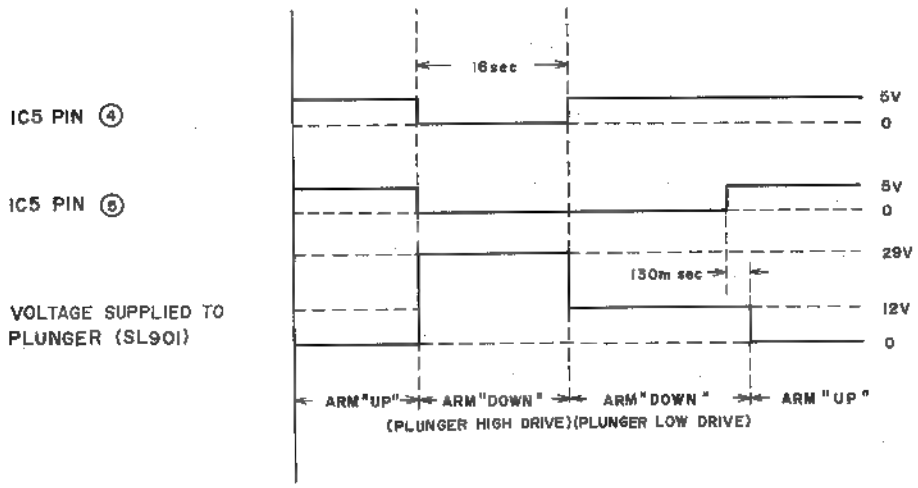


Fig. 5-7 Timing Chart

1) The Plunger high drive output (IC5 pin ④) is "H" when the Tone Arm is raised and also while the Tone Arm is up, and "L" for 1.6 seconds while the Tone Arm descends and "H" after that 1.6 seconds as shown in Fig. 5-7.
   The Plunger drive output (IC5 pin ⑤) is "H" when the Tone Arm is raised, also while the Tone Arm is up, and "L" while the Tone Arm descends, also while the Tone Arm is down.
2) Consequently, in the cases when the START button is depressed or the DOWN button is depressed in either AUTO or MANUAL modes, IC5 pin ④ becomes "L" for 1.6 seconds and IC5 pin ⑤ becomes "L", so TR17 & 18 are turned "ON" for 1.6 seconds and also TR15 & 16 are turned "ON". Thus the Arm Lifter Plunger (SL901) is driven by +29V (Plunger High Drive) for 1.6 seconds and is also driven by +12V after that 1.6 seconds.
3) In the cases when the CUT or UP button is depressed or Auto Lead-in is activated, IC5 pin ④ becomes "H" (IC5 pin ⑤ is still "H") so TR17 & 18 are turned "OFF" and TR15 & 16 are turned "OFF" after 130 msec (so that MUTE works before the Tone Arm rises) by C37 as shown in Fig. 5-6.

5-8. DETECTION OF TONE ARM POSITION (Refer to Fig. 5-8)

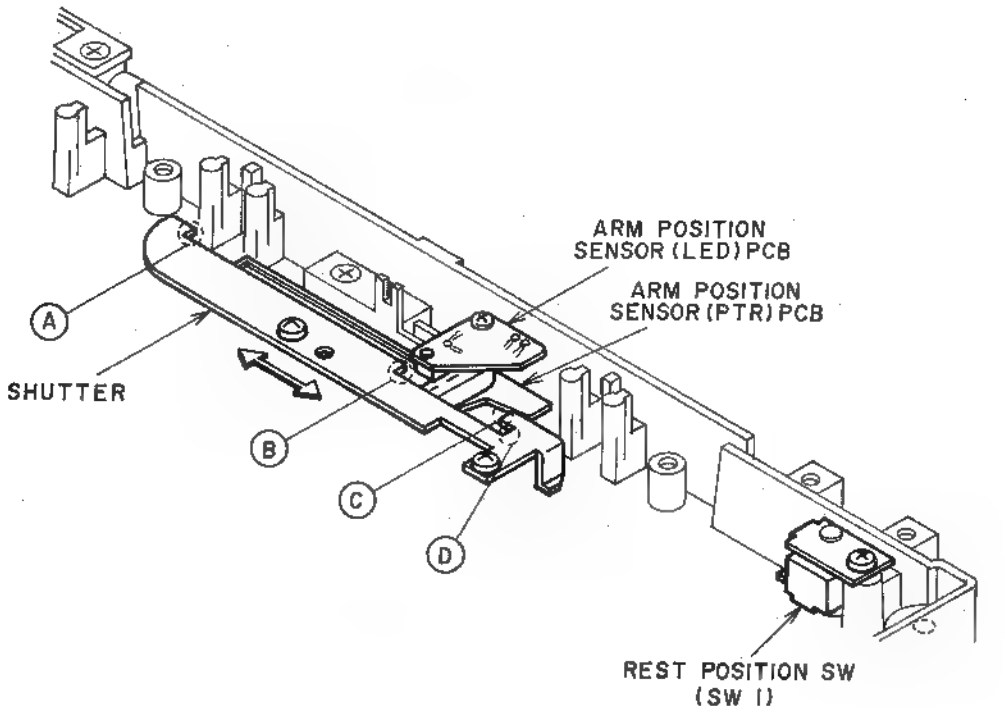


Fig. 5-8 Arm Position Sensors

1) REST (Stand-by) position is detected by the Rest Position SW (SW1) on Rest Position SW P.C BOARD, and its output is supplied to MI-COM IC5 pin ㉟. Accordingly, the level "H" at IC5 pin ㉟ means that the Tone Arm is in the REST position, and "L" means that it is out of the REST position.
2) LEAD-IN/OUT positions are detected by the Arm Position Sensors (Photo-transistor PH-1 & PH-2) on Arm Position Sensor (PTR) P.C BOARD, and their outputs are supplied to MI-COM IC5 pin ㉝ & ㉞ respectively.
   The LEAD-IN position is detected when the Shutter part Ⓐ (for 30 cm records) or part Ⓑ (for 17 cm records) passes through the space between LED (D1) and Photo-transistors (PH1/PH2).
   The LEAD-OUT position is detected when the Shutter part Ⓒ (for 30 cm records) or part Ⓓ (for 17 cm) passes through the same place.

5-9. MISCELLANEOUS REMARKS (Fail Safe Functions, etc.)

1) The Auto Lift-up System will lift up the Tone Arm to prevent the damage to the stylus when the power is cut off during playback.
2) The Tone Arm will not be moved by the FWD/REV buttons or lowered when the Tone Arm is out of the playable area (between Lead-in and Lead-out position for 30 cm or 17 cm records according to the size indicator).
3) If no record is on the platter but the Tone Arm is in the playable area, the Tone Arm will not descend but will return to the rest position even if the START button is depressed.
4) If no record is in AUTO mode, AUTO mode will be cancelled and the Tone Arm will not be activated even if the S/C button is depressed.
5) Fundamentally, the Auto Lead-in/Lead-out operations are not executed in the MANUAL mode. However, the Auto Lead-out operation will the executed for the one case when the Tone Arm reaches the 17 cm Lead-out position.
6) The unit will not AUTO-START if the platter does not start turning for some reason.
7) To avoid the unwanted impulse noise when muting, the capacitor C10 (22μF/10) is connected to the base of TR7 through R126 (4.7K), so that TR7 turns ON & OFF gradually to reduce the ON/OFF impulse noise caused by the Lead Relay (RL-1).
8) When playing transparent, colored (red, blue, white, etc.) or irregular sized (not 30 cm nor 17 cm) records, the Size Sensors cannot detect the correct amount of light and MI-COM may malfunction. For such cases, manual playback of the record must be adopted.
9) Refer to the AP-M5 Service Manual for the descriptions of the Power Supply Circuit, Power Supply Timing, Record Size Detection and Speed Determination, and to the AP-D30/C Service Manual for the description of the FG Servo Motor since these have a close similarity to those in the AP-M7/S.

VI. MECHANICAL ADJUSTMENT

6-1. ORDINARY MECHANICAL ADJUSTMENTS (Refer to Fig. 6-1)

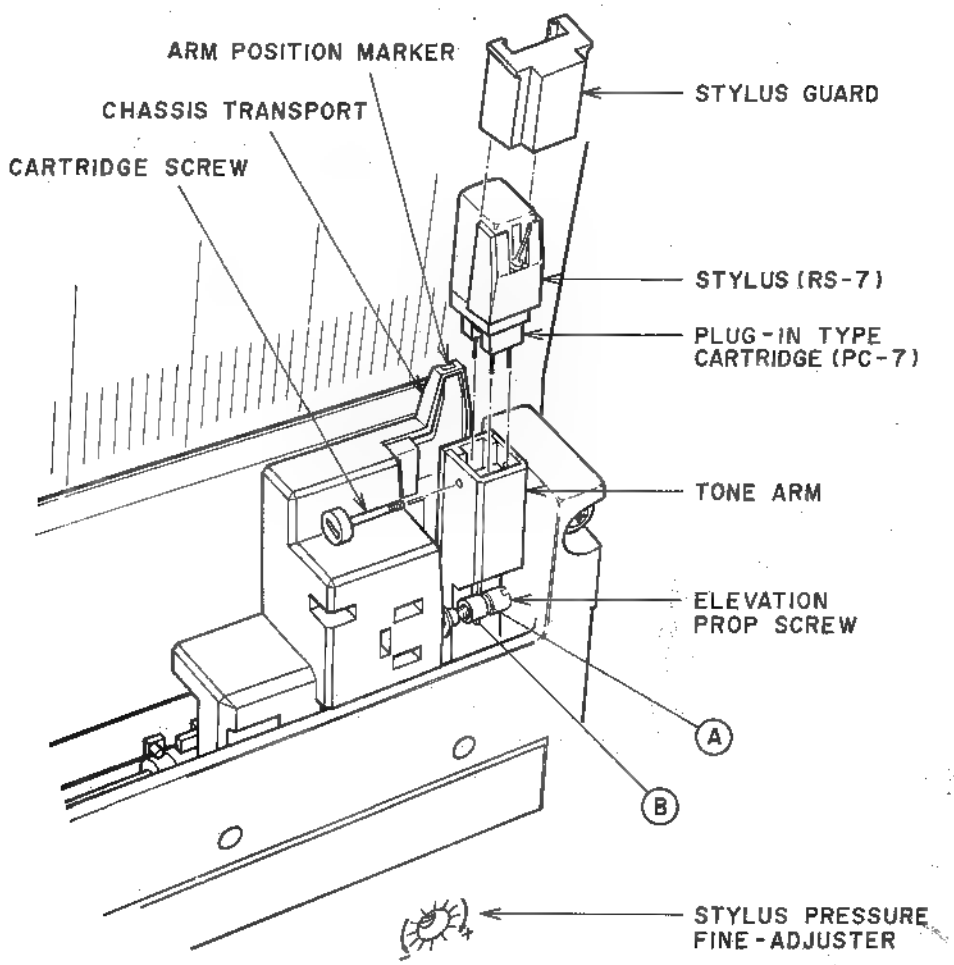


Fig. 6-1 Outside View of Moving Base Block

1) Ordinary Mechanical Adjustments such as Stylus Pressure, Overhang and Tone Arm Height Adjustment are not necessary since this model is equipped with a Dynamic-Balance linear tracking Tone Arm and a VM cartridge with plug-in connector. (Any brands of cartridges with 'T4P' mark are applicable without any adjustments. However a cartridge which has the same output voltage (3.5 mV/1 kHz, 5 cm/sec peak) is recommended.)
2) Stylus Pressure is pre-adjusted to 1.25 grams at the factory, and re-adjustment is not necessary in normal conditions.
   However, this model is equipped with the Stylus Pressure Fine-Adjuster located below the Tone Arm section shown in Fig. 6-1.
   Adjust it only when, for some reason, (Temperature, etc.) the stylus skips or there is distortion in the sound.
   Stylus Pressure can be adjusted from the minimum 0.5 grams (Adjuster-fully counter-clockwise) to the maximum 2.0 grams (Adjuster-fully clockwise) centering around 1.25 grams. In other words, Stylus Pressure can be adjusted within 1.25 ± 0.75 grams by turning the adjuster clockwise or counterclockwise through an angle of about 45 degrees in each direction.

6-2. LEAD-IN POSITION ADJUSTMENT (Refer to Fig. 6-2)

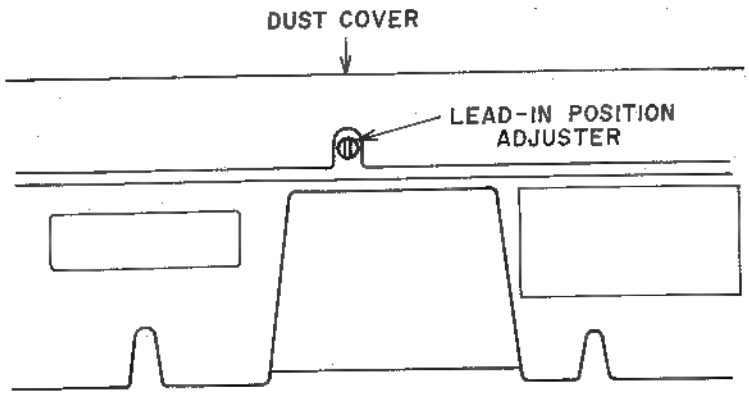


Fig. 6-2 Rear View

1) Place a 17 cm record on the platter, and play in AUTO mode.
2) Confirm the position where the stylus descends.
3) If this Lead-in position is incorrect, it can be adjusted by turning the Lead-in position adjuster clockwise or counter-clockwise with a flat type screw driver.
   Clockwise: To make the stylus descends away from the spindle.
   Counter-clockwise: To make the stylus descends towards the spindle.

6-3. ARM ELEVATION POSITION ADJUSTMENT (Refer to Fig. 6-1)

1) This adjustment is not necessary unless the Arm Elevation (A) on Elevation Position Screw is replaced or mis-adjusted.
2) Hold the Tone Arm with the Chassis Transport and separate the Elevation Prop Screw from the Tone Arm. Then bring the Elevation Prop Screw close to the Tone Arm, and adjust the Elevation Prop Screw with a flat type screwdriver to the place where the position of the notch Ⓐ on the Elevation Prop Screw coincides with the projecting part Ⓑ on the Tone Arm as shown in Fig. 6-1.

VII. ELECTRICAL ADJUSTMENT

7-1. ARM SENSOR VOLTAGE ADJUSTMENT (Refer to Fig. 7-1)

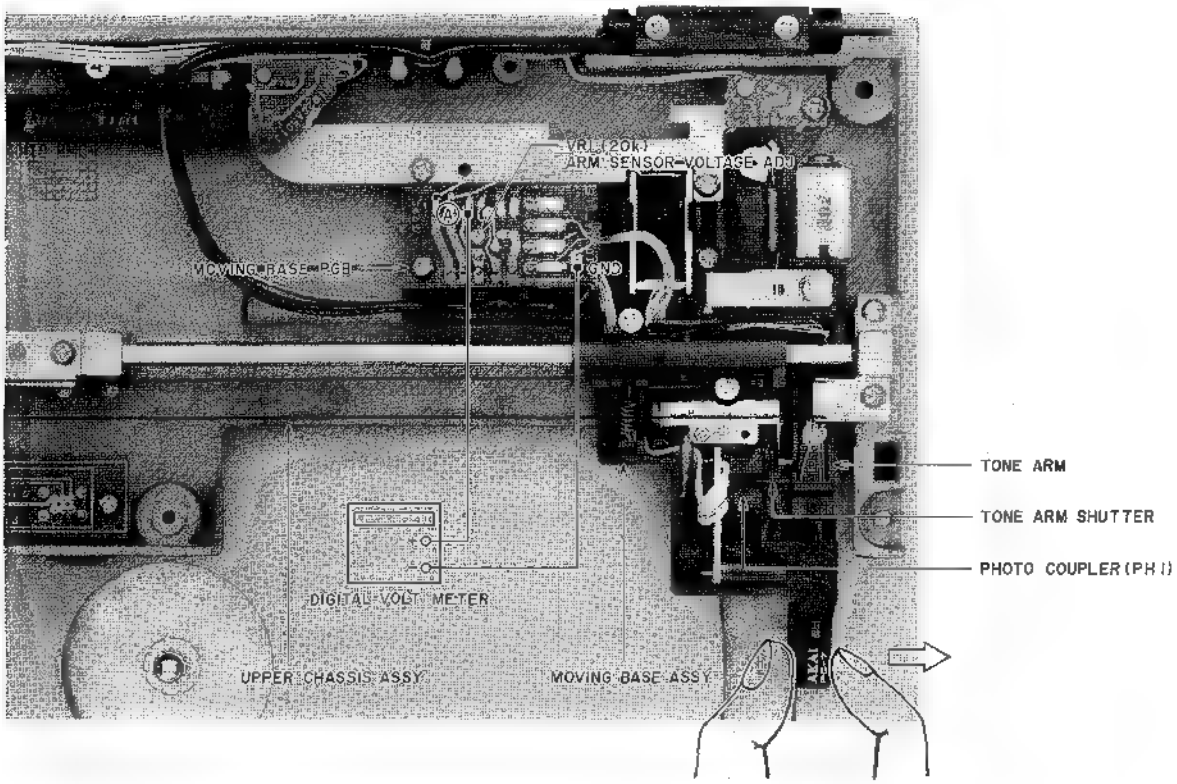


Fig. 7-1 Inside View of Moving Base Block

1) Take off the Dust Cover from the Chassis Upper Assy by loosening the five screws.
2) Connect a digital voltmeter between the point Ⓐ and ground. Move the Tone Arm by hand in the direction as shown in Fig. 7-1 to move the Tone Arm Shutter out of the photocoupler, and adjust VR1 on MOVING BASE P.C Board so that the voltmeter reads 4.1V ± 0.1V.
3) After the adjustment in item 2) is completed, move the Tone Arm back to the original position and confirm that the voltage at the point Ⓐ is more than 1.8V. If the voltage is less than 1.8V, re-adjust VR1 so that the voltage is 2.0V ± 0.1V.

7-2. SPEED ADJUSTMENT (Refer to Fig. 7-2)

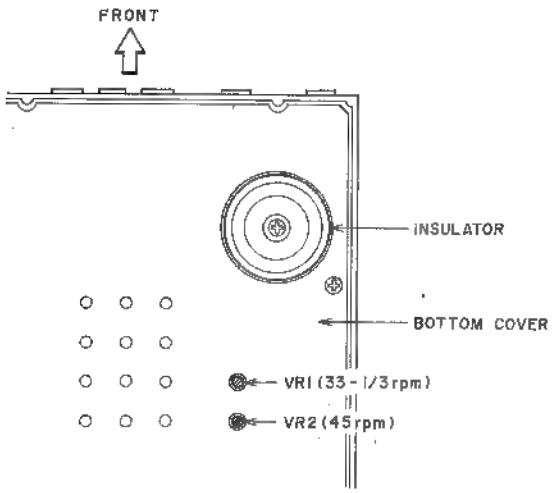


Fig. 7-2 Bottom View

1) Using Test Records
   1. Play a Test Record (33-1/3 rpm, 1,000 Hz)
   2. Set the Speed Selector to 33-1/3 rpm.
   3. Adjust VR1 (3K) so that the speed is 1,000 Hz ± 5 Hz.
   4. Set the Speed Selector to 45 rpm.
   5. Play a Test Record (45 rpm, 1,000 Hz)
   6. Adjust VR4 (20K) so that the speed is 1,000 Hz ± 5 Hz.
2) Using a stroboplate
   1. Set the Speed Selector to 33-1/3 rpm.
   2. Adjust VR1 (3K) so that the strobe (33-1/3 rpm, 50 or 60 Hz) stays still.
   3. Set the Speed Selector to 45 rpm.
   4. Adjust VR2 (20K) so that the strobe (45 rpm 50 or 60 Hz) stays still.

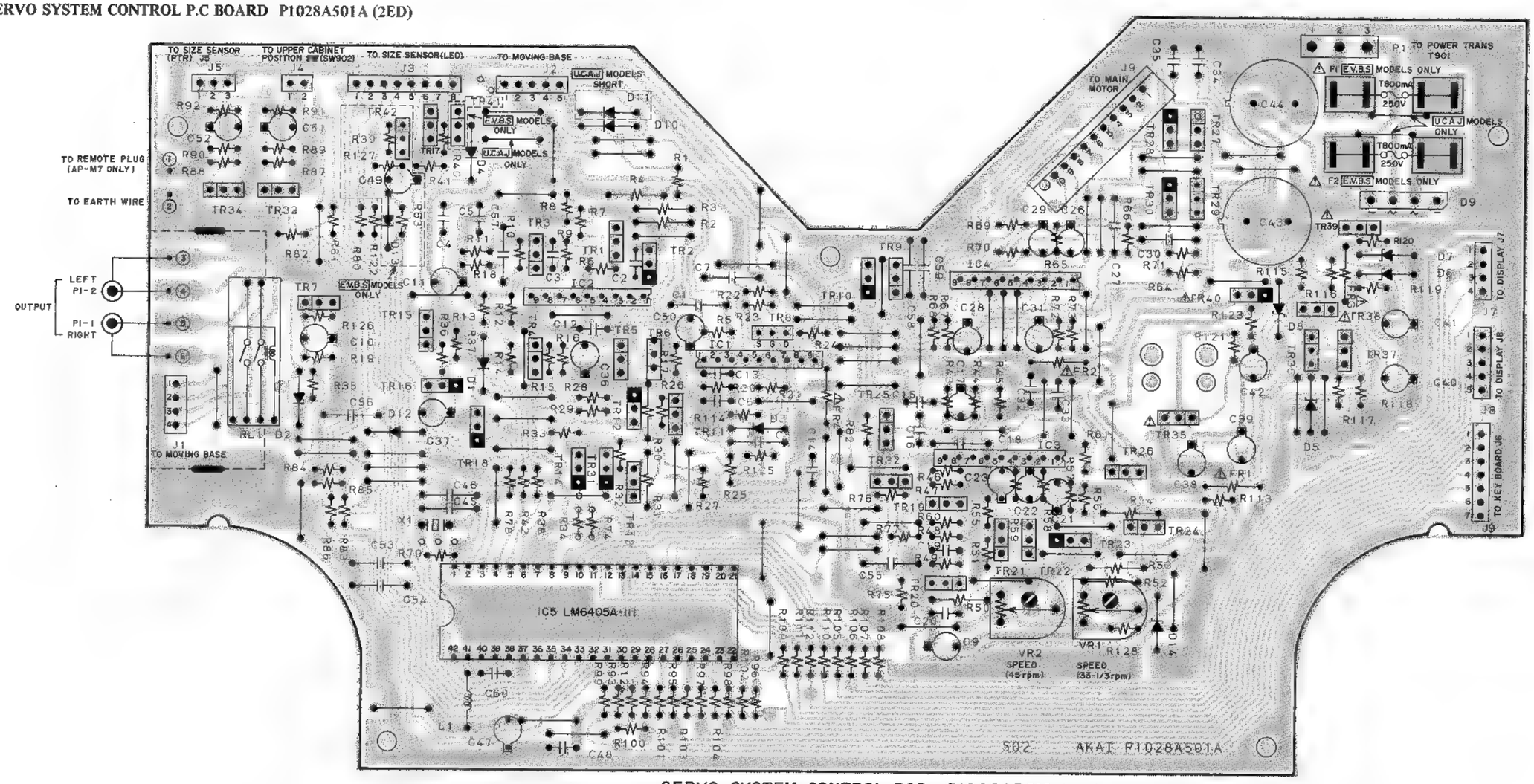
VIII. CLASSIFICATION OF VARIOUS P.C BOARDS

8-1. P.C BOARD TITLES AND IDENTIFICATION NUMBERS

P.C Board Title		P.C Board Number
Servo System Control	P.C Board	P1028A501A (2ED)
Size Sensor (LED)	P.C Board	P1028A501B
Size Sensor (PTR)	P.C Board	P1028A501C
Display	P.C Board	P1028A501D
Moving Base	P.C Board	P1028A501E
Tracking Sensor	P.C Board	P1028A501F
Power Supply	P.C Board	P1028A501G
Arm Position Sensor (PTR)	P.C Board	P1028A501H
Arm Position Sensor (LED)	P.C Board	P1028A501J
Rest Position SW	P.C Board	P1028A501K
Key Board	P.C Board	P1029C5020

8-2. COMPOSITION OF VARIOUS P.C BOARDS

1) SERVO SYSTEM CONTROL P.C BOARD P1028A501A (2ED)



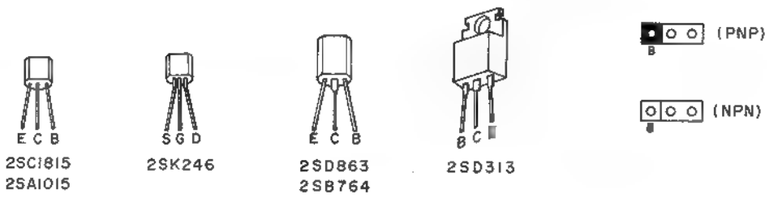
SERVO SYSTEM CONTROL PCB P1028A501A (2ED)

TR1, 3 to 7, 11, 13, 19 to 22, 24 to 26
32 to 34, 36, 37, 42 --- 2SC1815(Y, GR)
TR2, 12, 14, 16, 18, 23, 31 ---------- 2SA1015(O, Y)
TR8 ---------- 2SK246(GR)
TR9, 15, 17, 27, 29, 41 ---------- 2SD863(E, F)
TR10, 28, 30, 40 ---------- 2SB764(E, F)
TR35, 38, 39 ---------- 2SD313

IC1, 3 --- NJM4558S
IC2 ---- TA75393S
IC4 ---- LA6458SF

COLOR CODE

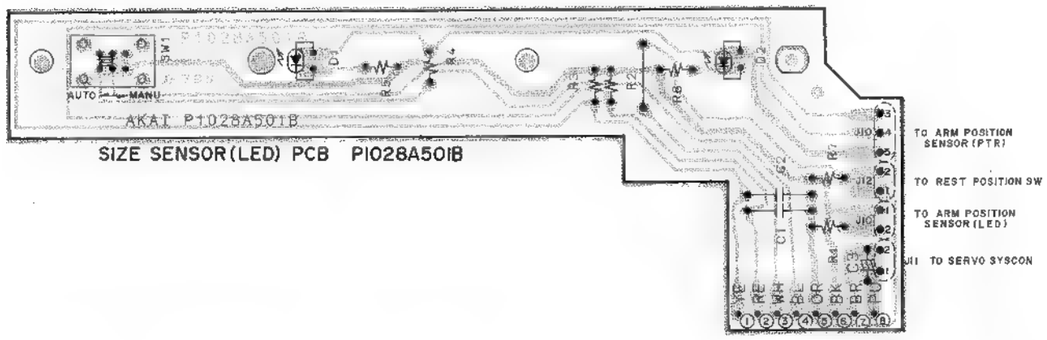
B, BL	: BLUE	Y, YE	: YELLOW
G	: GREEN	BK	: BLACK
O, OR	: ORANGE	PU	: PURPLE
Y, YE	: YELLOW		



WARNING: ⚠ INDICATES SAFETY CRITICAL COMPONENTS. FOR CONTINUED SAFETY, REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S RECOMMENDED PARTS

AVERTISSEMENT: ⚠ IL INDIQUE LES COMPOSANTS CRITIQUES DE SÉCURITÉ. POUR MAINTENIR LE DEGRÉ DE SÉCURITÉ DE L'APPAREIL, NE REMPLACER QUE DES PIÈCES RECOMMANDÉES PAR LE FABRICANT

2) SIZE SENSOR (LED) P.C BOARD P1028A501B

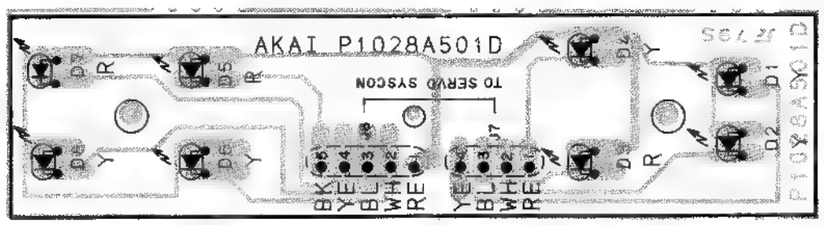


SIZE SENSOR(LED) PCB P1028A501B

3) SIZE SENSOR (PTR) P.C BOARD P1028A501C

SIZE SENSOR (PTR) PCB
P1028A501C

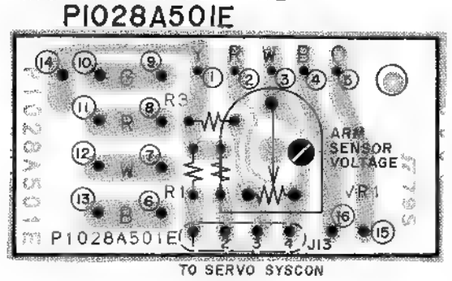
4) DISPLAY P.C BOARD P1028A501D



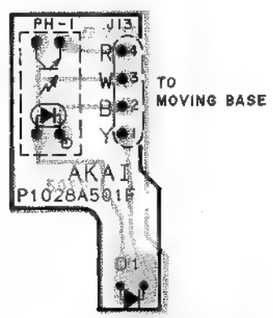
DISPLAY PCB
P1028A501D

5) MOVING BASE P.C BOARD P1028A501E

MOVING BASE PCB
P1028A501E

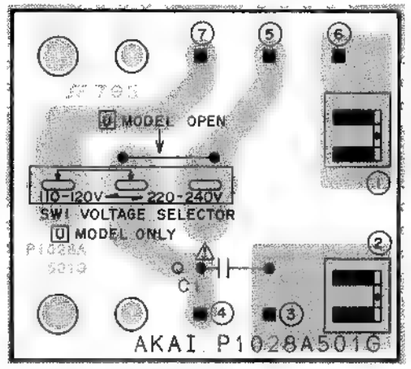


6) TRACKING SENSOR P.C BOARD P1028A501F



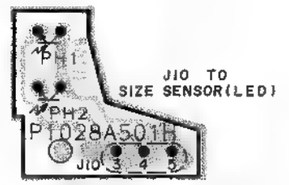
TRACKING SENSOR PCB
P1028A501F

7) POWER SUPPLY P.C BOARD P1028A501G



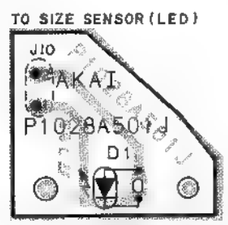
POWER SUPPLY PCB
P1028A501G

8) ARM POSITION SENSOR (PTR)
P.C BOARD P1028A501H



ARM POSITION SENSOR(PTR)
PCB P1028A501H

9) ARM POSITION SENSOR (LED)
P.C BOARD P1028A501J

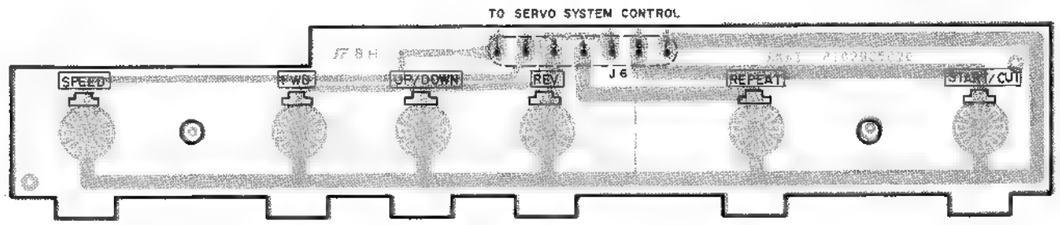


ARM POSITION SENSOR(LED)
PCB P1028A501J

10) REST POSITION SW P.C BOARD
P1028A501K

REST POSITION SW PCB
P1028A501K

11) KEY BOARD P.C BOARD P1029C5020



KEY BOARD PCB P1029C5020

SECTION 3

PARTS LIST

TABLE OF CONTENTS

Numbers are assigned when each part is first listed in the parts list. Once assigned, the number is not changed.

ATTENTION

1. When placing an order for parts, be sure to list the parts no. model no. and description. There are instances in which if any of this information is omitted, parts cannot be shipped or the wrong parts will be delivered.
2. Please be careful not to make a mistake in the parts no. If the parts no. is in error, a part different from the one ordered may be delivered.
3. Because parts number and parts unit supply in the Preliminary Parts List may be partially changed, please use this parts list for all future reference.

HOW TO USE THIS PARTS LIST

1. This Parts List shows the parts that are considered necessary for repairs. Other parts, such as resistors and capacitors, are shown in the "Common List for Service Parts". Select and order such parts from the "Common List for Service Parts".
2. The Recommended Spare Parts shows those parts in the Parts List which are considered particularly important for service.
3. Parts not shown in the.Parts List and "Common List for Service Parts" will not be supplied in principle.
4. How to read list

a) Mechanism Block

2. HEAD BASE BLOCK

REF. NO.	PARTS NO.	DESCRIPTION
2-1x	BH-T2023A320A	HEAD BASE BLOCK GX-F66R
2-2	HP-H2206A010A	HEAD R/P PR4-8FU C
2-3	ZS-477876	PAN20x03STL CMT
2-4	ZS-536488	BID20x08STL CMT
2-5	ZG-402895	CS ANGLE ADJUST SPRING

SP (Service Parts) Classification

A small "x" indicates the inability to show that particular part in the Photo or Illustration.

This number corresponds with the individual parts index number in that figure

This number corresponds with the Figure Number

b) P.C Board Block

6. SYS. CON. P.C BOARD BLOCK

REF. NO.	PARTS NO.	DESCRIPTION
6-1	BA-T2034A070A	PC SYS CON BLK GX-F44R
6-IC1	EI-324536	IC HD14049BP
6-IC2	EI-336801	IC MB8841-564M
6-IC3	EI-331661	IC SN7405N
6-IC4	EI-336725	IC M54527P
6-TR1to4	ET-200985	TR 2SC2603 F,G
6-TR5to28	ET-554657	TR 2SA733A P,Q
6-D1	ED-318292	D SILICON H 1S2473T-77 T26
6-D2to4	ED-308952	D GERMA V 1K34A-LR F07
6-D5to10	ED-318292	D SILICON H 1S2473T-77 T26
6-X1	EI-318384	OSC X'TAL NC-18C 3.579545MHZ

SP (Service Parts) Classification

This reference numbers corresponds with symbol numbers of Schematic Diagrams.

5. Both the kind of part and installation position can be determined by the Parts Number. To determine where a parts number is listed, utilize Parts Index at end of Parts List. It is necessary first of all to find the Parts Number. This can be accomplished by using the Reference Number listed at right of parts number in the Parts Index.

WARNING

⚠ INDICATES SAFETY CRITICAL COMPONENTS. FOR CONTINUED SAFETY, REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S RECOMMENDED PARTS.

AVERTISSEMENT

⚠ IL INDIQUE LES COMPOSANTS CRITIQUES DE SURETE. POUR MAINTENIR LE DEGRE DE SECURITE DE L'APPAREIL, NE REMPLACER LES COMPOSANTS DONT LE FONCTIONNEMENT EST CRITIQUE POUR LA SECURITE QUE PAR DES PIECES RECOMMANDEES PAR LE FABRICANT.

RECOMMENDED SPARE PARTS

Because, if the parts listed below are on hand, almost any repair can be accomplished, we suggest that you stock these Recommended Spare Parts Items.

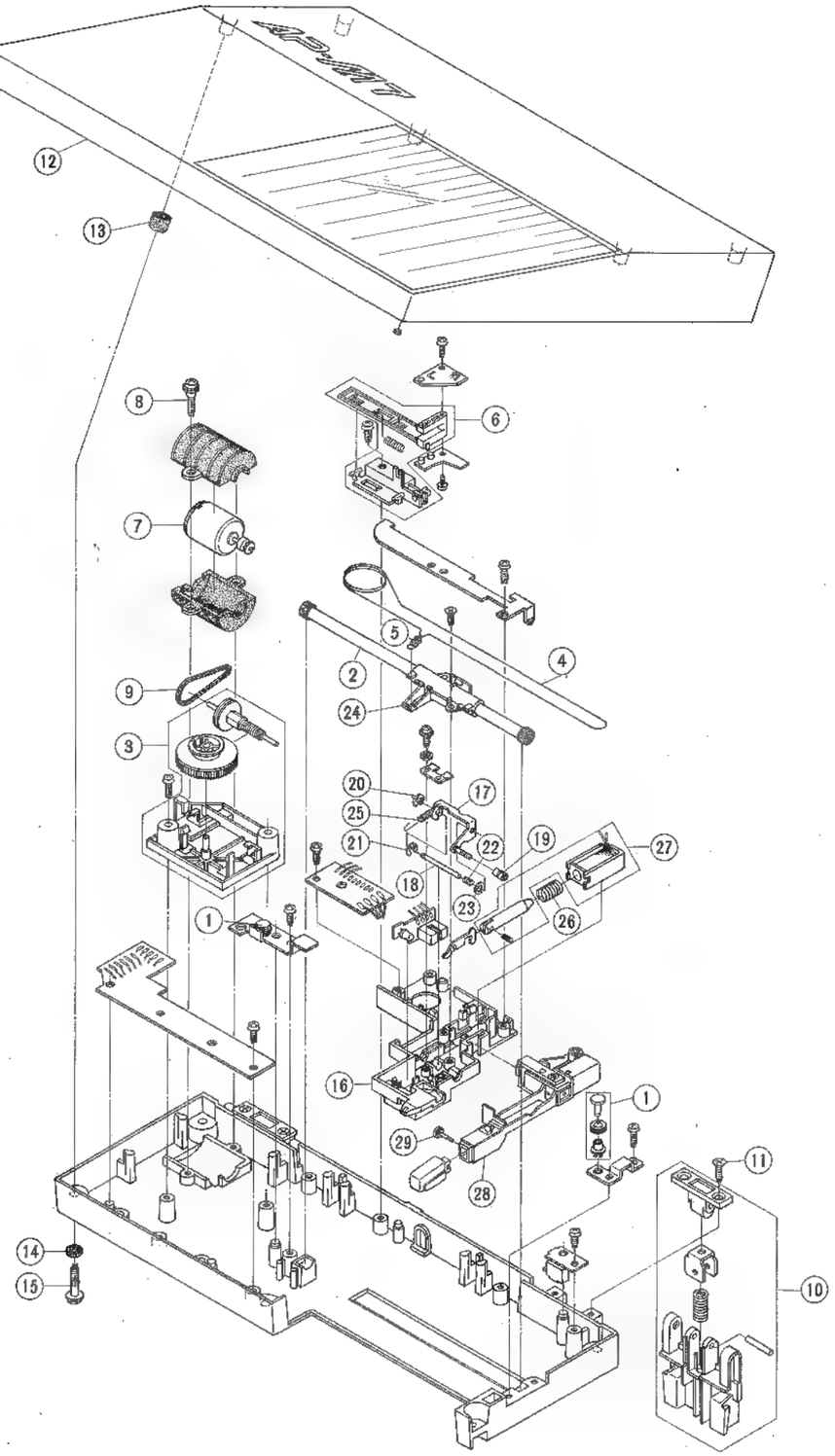
NO.	PARTS NO.	DESCRIPTION
1	BM-P1028A090A	MAIN MOTOR BLK AP-M7 (M901)
2	BM-344453	MOTOR VA905B01 (W/PULLEY)
3	BT-344456	⚠ TRANS POWER APT7-10(J)(T901)
4	BT-344457	⚠ TRANS POWER APT7-30(C,A) (T901)
5	BT-344458	⚠ TRANS POWER APT7-40(E,V) (T901)
6	BT-344459	⚠ TRANS POWER APT7-50(B,S) (T901)
7	BT-344455	⚠ TRANS POWER APT7-70(U)(T901)
8	ED-337092	D LED GL9HY4 YLW
9	ED-328791	D LED GL9PR4 RED
10	ED-337379	D LED NJL1102EH INFRARED
11	ED-344464	D LED SLP145A RED
12	ED-557447	D SILICON H 1S1588
13	ED-321115	D SILICON H 1S1588LB-5 F10
14	ED-306724	D SILICON S5277B 100/1.0A
15	ED-322238	D SILICON 1B4B41 100/1.0A
16	ED-343996	D ZENER H HZ12 B1
17	ED-309959	D ZENER H HZ5 C3
18	ED-338559	D ZENER HZ6 B1
19	EF-300603	⚠ FUSE FST3100 T 250V 0.8A (F2)(E,V,B,S)
20	EF-300603	⚠ FUSE FST3100 T 250V 0.8A (F1)(E,V,B,S)
21	EI-338390	IC LA6458S-AKAI
22	EI-344462	IC LM6405A-111
23	EI-201940	IC NJM4558S
24	EI-344461	IC TA75393S
25	EO-345909	COIL FIX 1 LAL03KH 4.70UH K
26	EP-322437	RELAY LEAD LAB2NS 2NO 5V
27	EP-344450	SOLENOID 0531TLT 12V (SL901)
28	ER-319455	⚠ R FUSE ERD2FC F10 1/4W 10R0G
29	ES-337902	⚠ SW PUSH SDLD1P 01-1 (SW901)
30	ES-337898	⚠ SW SLIDE 00120163 01-2 (U ONLY)
31	ES-336814	SW LEAF MSW-1150NBK 01-1 NO (SW902)
32	ES-344473	SW PUSH SCL101T 1-01-02N
33	ES-343366	SW SLIDE HSW0700-010 2-02-02N
34	ET-318237	⚠ TR 2SB764 E,F
35	ET-336941	⚠ TR 2SD313 E,F
36	ET-337759	TR FET 2SK246 GR
37	ET-337378	TR PHOTO SENSOR NJL7260E
38	ET-337891	TR PHOTO SENSOR PH101
39	ET-325501	TR 2SA1015 O,Y
40	ET-318237	TR 2SB764 E,F
41	ET-307234	TR 2SC1815 Y,GR
42	ET-318239	TR 2SD863 E,F
43	EV-337924	R S-FIX H TM8KW3-3S 3P 0.30W 302
44	EV-337925	R S-FIX TM8KV3-3S 3P 0.30W 203
45	EZ-348409	OSC CE CSB400P 0.4 MHZ
46	MB-344538	BELT 1.2×D26.0CRHS60

1. SERVO SYSTEM CONTROL P.C BOARD BLOCK

REF. NO.	PARTS NO.	DESCRIPTION
1-1U	BA-P1028A080A	PC SERVO SYSCON BLK AP-M7(U)
1-1J	BA-P1028A080B	PC SERVO SYSCON BLK AP-M7(J) (J,C)
1-1A	BA-P1028A080C	PC SERVO SYSCON BLK AP-M7(A)
1-1E	BA-P1028A080D	PC SERVO SYSCON BLK AP-M7(E) (E,V,B,S)
		SERVO SYSTEM CONTROL P.C BOARD
1-IC1A	EI-201940	IC NJM4558S
1-IC2A	EI-344461	IC TA75393S
1-IC3A	EI-201940	IC NJM4558S
1-IC4A	EI-338390	IC LA6458S-AKAI
1-IC5A	EI-344462	IC LM6405A-111
1-TR1A	ET-307234	TR 2SC1815 Y,GR
1-TR2A	ET-325501	TR 2SA1015 O,Y
1-TR3Ato7A	ET-307234	TR 2SC1815 Y,GR
1-TR8A	ET-337759	TR FET 2SK246 GR
1-TR9A	ET-318239	TR 2SD863 E,F
1-TR10A	ET-318237	TR 2SB764 E,F
1-TR11A	ET-307234	TR 2SC1815 Y, GR
1-TR12A	ET-325501	TR 2SA1015 O,Y
1-TR13A	ET-307234	TR 2SC1815 Y,GR
1-TR14A	ET-325501	TR 2SA1015 O,Y
1-TR15A	ET-318239	TR 2SD863 E,F
1-TR16A	ET-325501	TR 2SA1015 O,Y
1-TR17A	ET-318239	TR 2SD863 E,F
1-TR18A	ET-325501	TR 2SA1015 O,Y
1-TR19Ato22A	ET-307234	TR 2SC1815 Y,GR
1-TR23A	ET-325501	TR 2SA1015 O,Y
1-TR24Ato26A	ET-307234	TR 2SC1815 Y,GR
1-TR27A	ET-318239	TR 2SD863 E,F
1-TR28A	ET-318237	TR 2SB764 E,F
1-TR29A	ET-318239	TR 2SD863 E,F
1-TR30A	ET-318237	TR 2SB764 E,F
1-TR31A	ET-325501	TR 2SA1015 O,Y
1-TR32Ato34A	ET-307234	TR 2SC1815 Y,GR
1-TR35A	ET-336941	⚠ TR 2SD313 E,F
1-TR36A,37A	ET-307234	TR 2SC1815 Y,GR
1-TR38A,39A	ET-336941	⚠ TR 2SD313 E,F
1-TR40A	ET-318237	⚠ TR 2SB764 E,F
1-TR41A	ET-318239	TR 2SD863 E,F (E,V,B,S)
1-TR42A	ET-307234	TR 2SC1815 Y,GR (E,V,B,S)
1-D1Ato3A	ED-557447	D SILICON H 1S1588
1-D4A	ED-306724	D SILICON S5277B 100/1.0A
1-D5A,6A	ED-338559	D ZENER HZ6 B1
1-D7A,8A	ED-343996	D ZENER H HZ12 B1
1-D9A	ED-322238	D SILICON 1B4B41 100/1.0A
1-D10A,11A	ED-306724	D SILICON S5277B 100/1.0A
1-D12A	ED-557447	D SILICON H 1S1588
1-D13A	ED-321115	D SILICON H 1S1588LB-5 F10
1-D14A	ED-309959	D ZENER H HZ5 C3
1-J9A	EJ-325088	SOCKET JUMPER W-D0610 10P
1-VR1A	EV-337924	R S-RIX H TM8KW3-3S 3P 0.30W 302
1-VR2A	EV-337925	R S-FIX TM8KV3-3S 3P 0.30W 203
1-RL1A	EP-322437	RELAY LEAD LAB2NS 2NO 5V
1-L1A	EO-345909	COIL FIX 1 LAL03KH 4.70UH K
1-X1A	EZ-348409	OSC CE CSB400P 0.4 MHz
1-FR1Ato4A	ER-319455	⚠ R FUSE ERD2FC F10 1/4W 10R0G
1-C20A	EC-309115	C COMP V AWS 104J 50DC
1-R2A	ER-696306	R MF H 1/4W 2001F
1-R3A	ER-311767	R MF H 1/4W 1201F
1-R4A	ER-312461	R MF H 1/4W 8200F
1-R30A	ER-310324	R MF H 1/4W 1001F
1-R31A	ER-311767	R MF H 1/4W 1201F
1-R50A	ER-336820	R MF H F10 1/4W 4703F
1-R52A	ER-318337	R MF H F10 1/4W 6801F
1-R53A	ER-311762	R MF H 1/4W 9101F
1-R54A	ER-310326	R MF H 1/4W 1002F

REF. NO.	PARTS NO.	DESCRIPTION
		SIZE SENSOR (LED) P.C BOARD
1-D1B,2B	ED-344464	D LED SLP145A RED
1-SW1B	ES-343366	SW SLIDE HSW0700-010 2-02-02N
		SIZE SENSOR (PTR) P.C BOARD
1-PH1C,2C	ET-337891	TR PHOTO SENSOR PH101
		DISPLAY P.C BOARD
1-D1D,2D	ED-337092	D LED GL9HY4 YLW
1-D3D	ED-328791	D LED GL9PR4 RED
1-D4D	ED-337092	D LED GL9HY4 YLW
1-D5D,6D	ED-328791	D LED GL9PR4 RED
1-D7D,8D	ED-337092	D LED GL9HY4 YLW
		MOVING BASE P.C BOARD
1-VR1E	EV-344465	R S-FIX H TM8KV2-3S 3P 0.50W 203
		TRACKING SENSOR P.C BOARD
1-PH1F	ET-344472	TR PHOTO SENSOR ON1128AK
1-D1F	ED-344471	LED SLP170A RED
		POWER SUPPLY P.C BOARD
1-SW1G	ES-337898	⚠ SW SLIDE 00120163 01-2 (U ONLY)
1-C1GU	EC-320548	⚠ C CE V F 103Z 250AC(U,J,C)
1-C1GA	EC-314688	⚠ C CE V FZ 103P 125AC (A)
1-C1GE	EC-338411	⚠ C CE V FZ 103P 400AC (E,V,B,S)
		ARM POSITION SENSOR (PTR) P.C BOARD
1-PH1H,2H	ET-337378	TR PHOTO SENSOR NJL7260E
		ARM POSITION SENSOR (LED) P.C BOARD
1-D1J	ED-337379	D LED NJL1102EH INFRARED
		REST POSITION SW P.C BOARD
1-SW1K	ES-344473	SW PUSH SCL101T 1-01-02N

CHASSIS BLOCK and MOVING BASE BLOCK



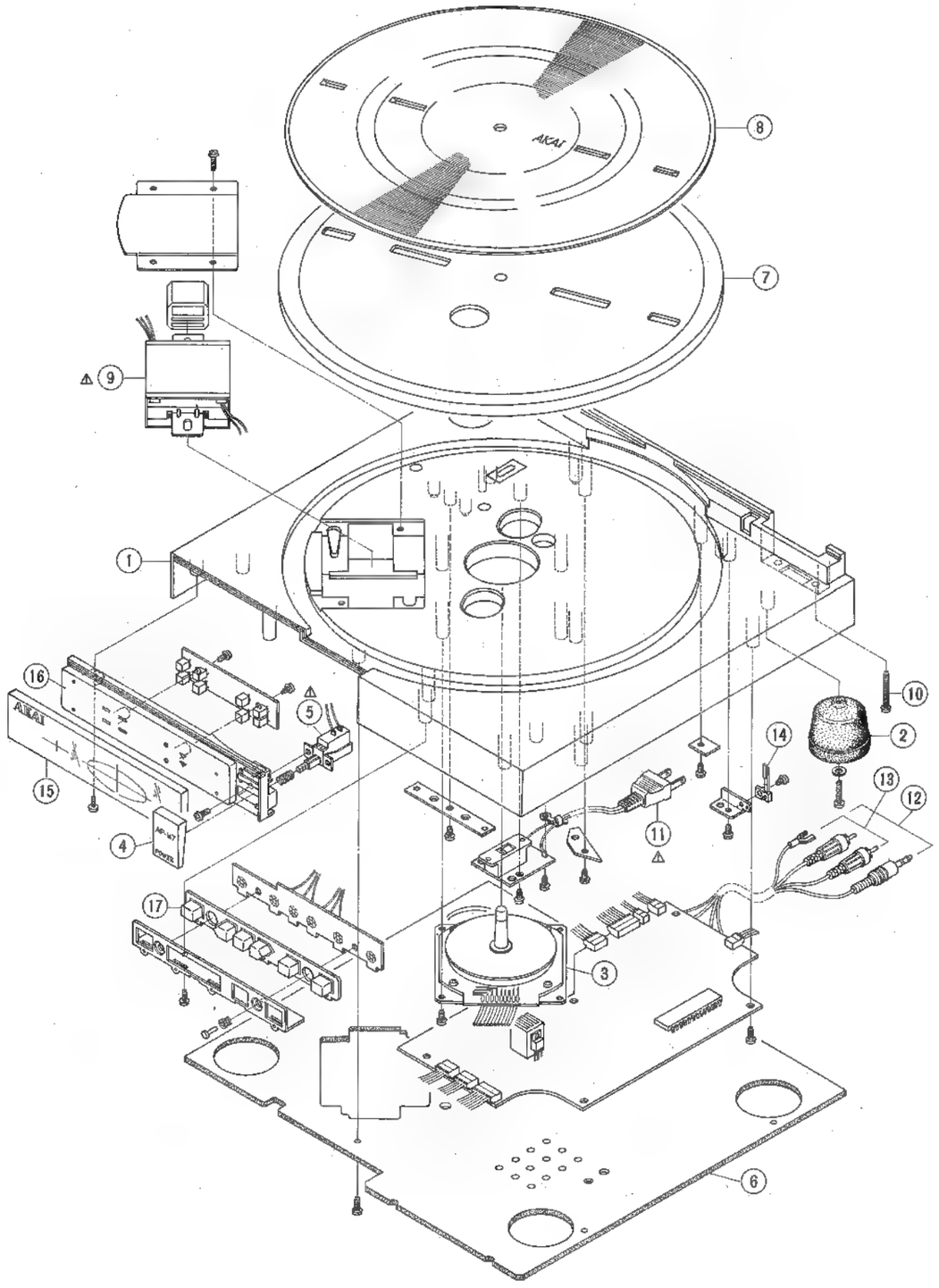
2. CHASSIS BLOCK and MOVING BASE BLOCK

REF. NO.	PARTS NO.	DESCRIPTION
2-1	MR-308836	PULLEY
2-2	MD-344528	RAIL GUIDE
2-3	MZ-B344524	HOLDER ROPE PULLEY PART
2-4	MD-344533	LORDING WIRE
2-5	ZG-344539	SP PULL WIRE
2-6	MZ-B344535	HOLDER POSITION SENSOR PART
2-7	BM-344453	MOTOR VA905B01 (W/PULLEY)
2-8	ZS-344826	■ SPL (B)
2-9	MB-344538	BELT 1.2×D26.0CRHS60
2-10	TP-P1028A040A	HINGE BLK AP-M7
2-11	ZS-325523	BT CTS30×16STL CMT
2-12	BC-B344555	DUST COVER PART
2-12S	BC-B344555C	DUST COVER-S PART (AP-M7-S)
2-13	MB-344541	CUSHION CHASSIS
2-14	MB-344543	BUSH CHASSIS
2-15	ZS-344825	S SPL (A)
2-16	MZ-B344519	CHASSIS TRACKING PART
2-17	TP-B344505	ARM ELEVATION (A) PART
2-18	MH-344509	PROP 1 ELEVATION
2-19	MH-345842	PROP 2 ELEVATION
2-20	ZW-356657	RING E 150SUP CMT
2-21	ZW-358018	RINGE200SUP ZNC
2-22	ZG-344557	SP PUSH ELEVATION
2-23	ZW-620188	WASHER (SPC) D3.3×6×0.3T
2-24	MZ-344523	HOLDER SLIDE
2-25	ZG-344530	SP PULL ELEVATION
2-26	ZG-344532	SP PUSH PLUNGER
2-27	EP-344450	SOLENOIDE 0531TLT 12V
2-28	TP-349000	TONE ARM ARM-7
2-29	ZS-780136	■ SPL F4-0281 (CARTRIDGE FIXING)

3. FINAL ASSEMBLY BLOCK

REF. NO.	PARTS NO.	DESCRIPTION
3-1	BF-344552	CABINET
3-1S	BC-344552C	CABINET-S (AP-M7-S)
3-2	TP-336281	INSULATOR
3-3	BM-P1028A090A	MAIN MOTOR BLK AP-M7 (M901)
3-4	SK-B344904A	KNOB POWER PART
3-4S	SK-B344904C	KNOB POWER-S PART (AP-M7-S)
3-5	ES-337902	⚠ SW PUSH SDLD1P 01-1 (SW901)
3-6	SP-344522	COVER BOTTOM
3-7	TP-343042	PLATTER
3-8	TP-343064B	TABLE SHEET (B)
3-9U	BT-344455	⚠ TRANS POWER APT7-70(U) (T901)
3-9J	BT-344456	⚠ TRANS POWER APT7-10(J) (T901)
3-9C	BT-344457	⚠ TRANS POWER APT7-30(C,A) (T901)
3-9E	BT-344458	⚠ TRANS POWER APT7-40(E,V) (T901)
3-9B	BT-344459	⚠ TRANS POWER APT7-50(B,S) (T901)
3-10	ZS-699197	T2BR30×20STL CMT
3-11U	EW-374894	⚠ AC CORD 2 CORES VM-0129A J(U)
3-11J	EW-524845	⚠ AC CORD 2 CORES VM1165B J(J)
3-11C	EW-305691	⚠ AC CORD 2 CORES KP-8, SPT-1 UC (C,A)
3-11E	EW-604618	⚠ AC CORD (EC) VM-0064 (E,V)
3-11B	EW-232244	⚠ AC CORD BASEC 2 CORE (B)
3-11S	EW-201515	⚠ AC CORD 2 CORES KP-560, LTSA-2F■ (S)
3-12	EW-337900	CORD UL 3P AUDIO
3-13	EW-325489	CORD P-54-075 2P AUDIO (AP-M7-S)
3-14	ES-336814	SW LEAF MSW-1150NBK 01-1 NO (SW902)
3-15	SE-344554	WINDOW LED
3-15S	SE-344554C	WINDOW LED-S (AP-M7-S)
3-16	SE-344556	ESCUTCHEON LED
3-17	SK-343062B	RUBBER BUTTON SHEET OPERATION (B)
3-17S	SK-343062D	RUBBER BUTTON SHEET OPERATION (B)-S
3-18X	EF-300603	⚠ FUSE FST3100 T 250V 0.8A (F1) (E,V,B,S)
3-19X	EF-300603	⚠ FUSE FST3100 T 250V 0.8A (F2) (E,V,B,S)

FINAL ASSEMBLY BLOCK

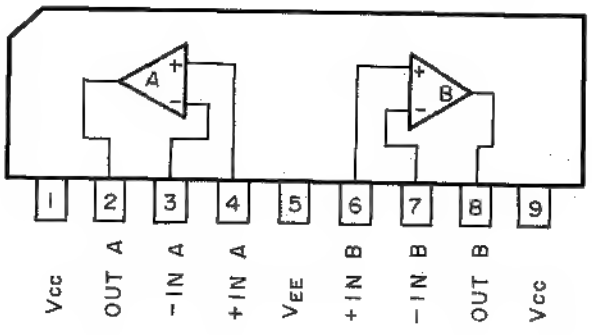


INDEX

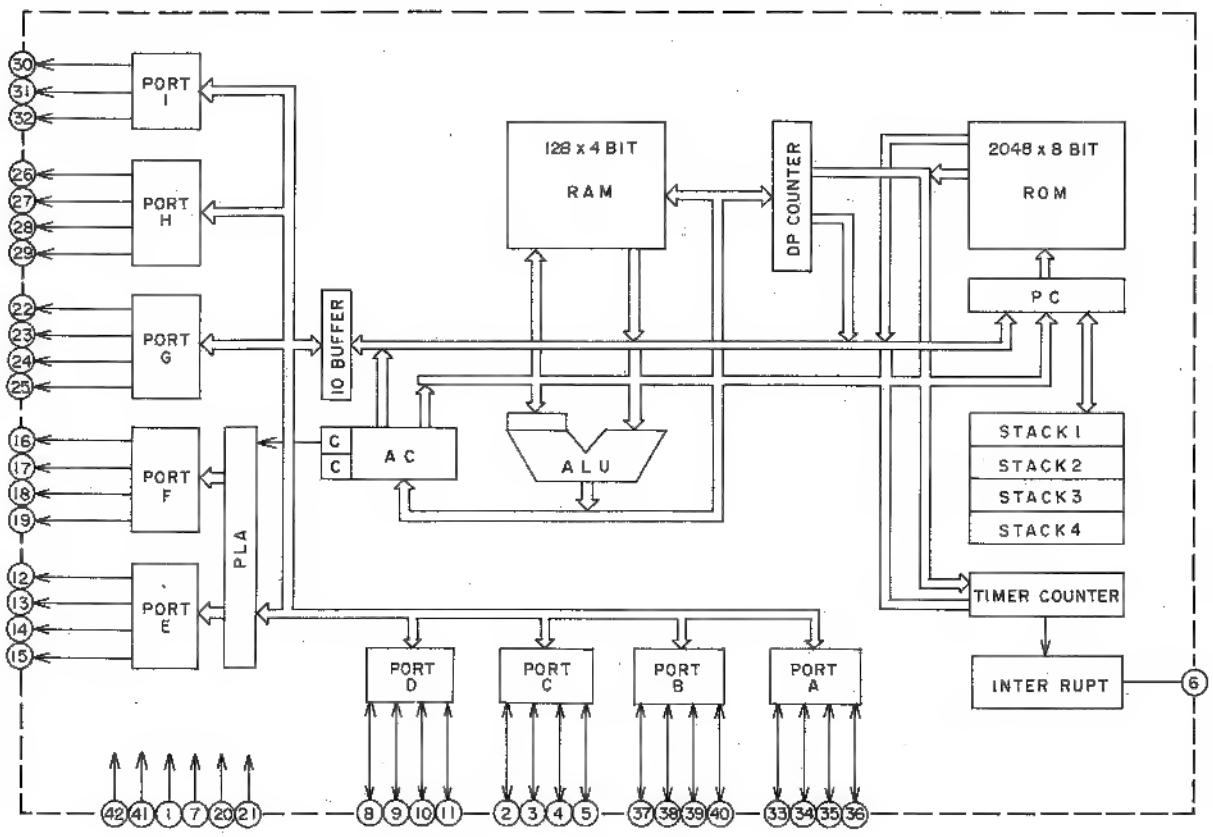
SECTION 3

SCHEMATIC DIAGRAM

LA6458SF, NJM4558S, TA75393S



LM6402



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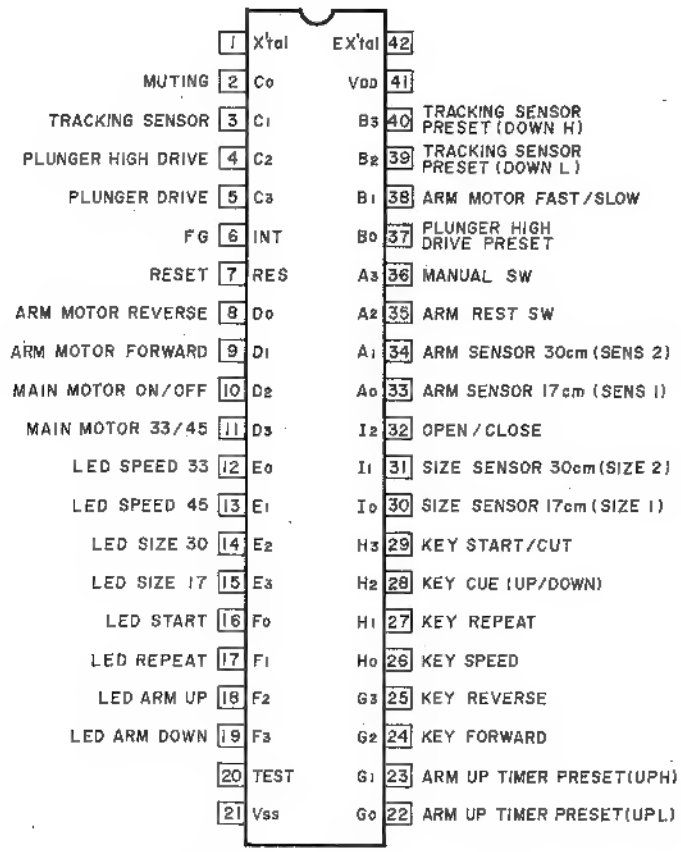

AP-M7/S

REST POSITION SW PCB
P1028A501K

SIZE SENSOR (LED) PCB
P1028A501B

ARM POSITION
SENSOR (PTR) PCB
P1028A501H

ARM POSITION
SENSOR (LED) PCB
P1028A501J

SIZE SENSOR (PTR) PCB
P1028A501C

MOVING BASE PCB
P1028A501E

SERVO SYSCON PCB
P1028A501A

TRACKING SENSOR PCB
P1028A501F

KEY BOARD PCB
P1029C5020

DISPLAY PCB
P1028A501D

POWER SUPPLY PCB
P1028A501G

POWER SUPPLY PCB
P1028A501G

MAIN MOTOR

2SK246 2SA1015 2SC1815 2SB764 2SD863 2SB313

B(POWER SUPPLY) LINE

NOTE
UNLESS OTHERWISE SPECIFIED
ALL RESISTORS IN OHMS 1/6W (J)
ALL CAPACITORS IN μF 50 WV (J)
(FS) : FAIL SAFE RESISTORS

WARNING: △ INDICATES SAFETY CRITICAL COMPONENTS FOR CONTINUED SAFETY, REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S RECOMMENDED PARTS
AVERTISSEMENT: △ IL INDIQUE LES COMPOSANTS CRITIQUES DE SÉCURITÉ. POUR MAINTENIR LE DEGRÉ DE SÉCURITÉ DE L'APPAREIL, NE REMPLACER QUE DES PIÈCES RECOMMANDÉES PAR LE FABRICANT

(TURNTABLE)
AP-M7/S
SCHEMATIC DIAGRAM
No. 830420A